

Nature *Magazine*

VOLUME 45

NUMBER 10



DECEMBER, 1952

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Nature in Print

By HOWARD ZAHNISER

WITH "Compliments of the Wyoming Game and Fish Commission" rubber-stamped on its front endpaper, there has recently come to our attention a most interesting and significant treatise on a single species of wildlife that deals not only with the species itself and its interest to hunters, not only with the "natural history and ecological phases" of the study on which it is based, but, indeed, in a broad sense with "land-use policies and political expediencies," protesting emphatically that the work would have been "erroneously conceived and derelict in its presentation" if it had not thus fully explored and appraised "the effects of an expanding civilization" on its subject. The book is Robert L. Patterson's *The Sage Grouse in Wyoming*. It deserves a respectable celebration and its author and publishers congratulations and appreciation of all those who are concerned with the inter-relationships of their lives and wildlife, and who are concerned thus, also, with the preservation of the natural wildness on which the continuation of our culture seems so dependent.

Let us not in our appreciative enthusiasms overlook, however, a recognition of the basic fact that Dr. Patterson has written an interesting and definitive treatise on the sage grouse in Wyoming. The history of the bird as seen in the writings of early explorers and in the later records of its fluctuating abundance is sketched in the early pages of the volume, and the characteristics, range, and distribution of the bird are there faithfully described. Nor is the reader long in approaching the scene of Dr. Patterson's intensive studies and enjoying his accounts of the natural history and life habits of the sage grouse as observed there, in the upper Green River Basin of western Wyoming, a region long famous as habitat for sage grouse. "Concerned primarily with yearlong investigations focused on an intimately known area of land," the study was carried on in "one of the largest primitive sagebrush areas on the continent," in an extensive valley "little changed by civilization" that supported sage grouse populations that were "impressive to Indian tribes and white men" alike. Through a remarkable series of some eight dozen full-page photographs the reader sees this sagebrush land pictured effectively by the author, and in it the sage grouse from eggs and day-old chicks to nesting hens and strutting cocks, even to the peak of mating activity. Eighteen sketches by Charles W. Schwartz with the graphic skill of an artist contribute further to a reader's sense of experience. And thus the technical figures, maps, tables, and text details of a scientific study — a study of basic importance that might well itself be discussed at length — are given some of the atmosphere and vitality of the sage grouse in its setting, from which all these "data" were once abstracted and regarding which "conclusions" were reached. *The Sage Grouse in Wyoming* is, in fact, an especially interesting wildlife report, not a "popular" or literary work but one in which the fascinating facts are simply and clearly stated and the results of a thorough study carefully presented.

But beyond these essential qualifications of a work with its

purpose, *The Sage Grouse in Wyoming* achieves a special excellence for its author proves himself generous and broad in his interests, sensitive to the interrelationships that he has been privileged to perceive, and courageous in his declarations of the truth he sees.

He has the courage to think first of the game bird, not the sportsmen who would hunt it, and even to declare that "by now it should be an old and well-established principle that the primary consideration in game management should always be the welfare of the game species."

Thus favoring his sage grouse when the bird needs and deserves favor in preference to hunters, he also is unselfish enough to refrain from favoring unwisely or unfairly a game species in preference to predators. And, unselfish thus, he likewise is candid and courageous enough to expose some of the often deliberately concealed difficulties in the way of a general understanding of the soundness of such a generous attitude toward predators.

"With few exceptions, predation upon wild game populations has operated," he clearly states, "not as a force impeding the desirable increase of game, but rather as an important check upon the increase of wildlife numbers above *undesired* limits." Again he states simply and directly: "The importance of predator control in the management of large and widely distributed game

populations has been grossly overplayed." He points out that "many officials have been conditioned to transpose the needs and values of predator control operations in the livestock industry to the management of wild game," and he goes on to explain that "this reasoning has been characteristic of many western legislative bodies and game departments which normally have close alliance with the livestock industry." Furthermore he has the understanding and courage to state clearly that beliefs in predator control to increase wildlife "openly expressed at high levels of administration and management make very difficult the task of educating the sporting public to a better understanding of predator-prey relationships in their favorite game habitats."

Dr. Patterson shows similar perspicacity when he rejects a description of sagebrush land as "mournful country" and, challenging the Bureau of Reclamation, opposes "the idea that

western sagebrush lands are worthless unless they are reclaimed for agricultural purposes." One of the earliest writers thus to speak out forcefully against the supposedly economic destruction of our natural areas of sagebrush, Dr. Patterson calls this plant "the most valuable food and cover plant for both livestock and wildlife on the ranges of the inter-mountain West." "A region which relies so heavily upon its livestock and recreation industries," he maintains with considerable force, "can ill afford to adopt a large-scale sagebrush eradication program founded upon inadequate consideration, ignorance of the basic facts, and the generousities of a government."

"Political parties," Dr. Patterson realizes, "measure progress in terms of new industrial plants and defense projects acquired within their respective domains. Seldom is any consideration given to the detrimental effects of such development upon the wildlife, recreational, and esthetic values, which in most western states outrank all other industries in the state in terms of gross income, capital value, and participation by the general public."

Whether it concerns agricultural reclamation projects, strip-mining destruction of the landscape, or other industrial developments that sacrifice the preservation of natural areas, Dr. Patterson sees the importance to both sage grouse and human

Wardian Case

By EDNA L. S. BARKER

In miniature the woodland floor
Seems growing as it was before
Man changed the channels of the streams
And Science was evolved from dreams.
These ferns, twigs, mosses, bits of rocks
Depict the young world in a box.
The dinosaur with tiny head
Came later, with ground-shaking tread;
Water was still untrapt by steel
Or wooden span, or racing wheel;
No bird wing small and beautiful
Dipped lightly in the Permian pool.
That airy singer yet unheard
Came from monstrous forms, the bird
Which is the voice of woodlands now.
Then Man, with low back-slanting brow,
Between the tree-ferns caught a glance
Of dawn, and slowly rose to upright stance.

beings of the preservation of the wild habitat that both require. "In view of a rapidly expanding population in industrial states such as California, Texas, Michigan, and Ohio, it would seem" to him "that states with low populations and superb recreational facilities could enhance local as well as national welfare by devoting a larger share of their resources and efforts to recreational development, rather than to an expanding industrial program and ultimate depletion of their expendable natural resources."

Thus he gives thought to the whole welfare not only of sage grouse but also of man. Thus *The Sage Grouse in Wyoming* is more than simply a bird book, more than a game study; it is rather a courageous approach to a study of a sound attitude toward a particular species of bird and toward the natural world that it shares with man. Its author is indeed to be congratulated. The agency also that sponsored the study and publication of the book deserves commendation. And thus, finally, to the Wyoming Game and Fish Commission and its federal cooperators we heartily return our introductory compliments, and express our best wishes for a wide and hearty acceptance of this their noteworthy publication.

The Sage Grouse in Wyoming. By Robert L. Patterson. Denver, Colo.: Sage Books, Inc. (for Wyoming Game and Fish Commission). 1952. xxiv + 341 pp. (9 7/8 by 6 1/4 in.), with 96 full-page photographs, 18 sketches by Charles W. Schwartz, 18 figures, 54 tables, bibliography, and index. \$5.

Prologue to History

Earth Song. By Charles L. Camp. Berkeley, California. 1952. University of California Press. 127 pages. \$5.00.

The subtitle of this book is "A Prologue to History," and it deals with prehistory of the region that is now known as California. Here are varied landscapes and climates, the Sierra Nevada, the rich valleys, desert and sea. There is rich record in the rocks; the story of fossil life. The author is Professor of Paleontology at the University of California, but his interests extend to man's history and the relationships he bears to his environment. This interesting book, written for lay reading, draws the background of that environment.

Eagle Man

Eagle Man. By Myrtle Jeanne Broley, with an introduction by Edwin Way Teale. New York. 1952. Pellegrini and Cudahy. 210 pages. Illustrated. \$3.50. As a banker in Canada, Charles Broley's hobby interest was bird observation. Then he retired from banking and spent much time in Florida, and elsewhere in the United States. In the process he became known as "The Eagle Man" for his studies of our national bird, the American or bald

eagle, and for his activities in banding these great birds. From the more prosaic business of banking, Charles Broley started to climb tall trees, spying on eagles, putting bands around the legs of the young, photographing the intimate details of eagle family life. With him went Mrs. Broley, also amateur naturalist and writer. This book is the story of field adventures with eagles, and it has as much excitement in it as it has important information about eagles. We are delighted that Mrs. Broley has recorded these adventures, and many will find real pleasure in reading about them.

Lemmon on Birds

Our Amazing Birds. By Robert S. Lemmon. New York. 1952. Doubleday and Co. 239 pages. Illustrated by Don R. Eckelberry. \$3.95.

Writer and editor, the author of this attractive book has been a student of birds all his life. Now he has indulged himself in telling about the private lives of more than one hundred bird species, doing so charmingly. This is a book that will delight any bird enthusiast, and it is the sort of bird book one can take up for relaxation, selecting at random a bird about which he would like to read at the moment.

Horse Pictures

Portfolio of Horses. By Wesley Dennis. Chicago. 1952. Rand McNally and Co. Twenty-three full color, 13- by 16-inch pictures. \$3.50.

This beautiful portfolio by an artist whose horse pictures are widely known and as widely appreciated, will delight all horse lovers, young or old. The pictures cover the principal breeds of horses, including the Arab, the great Belgian, the Thoroughbred and others. The pictures are supplemented by a commentary by Marguerite Henry, whose books Mr. Dennis has illustrated.

Sun, Moon, Planets

Sun, Moon and Planets. By Roy K. Marshall. New York. 1952. Henry Holt and Co. 129 pages. \$2.50.

This little book provides a concise and understandable introduction to our solar system. It is not a guide to the heavens but presents essential facts basic to a knowledge of the universe of which our earth is a part.

Grass

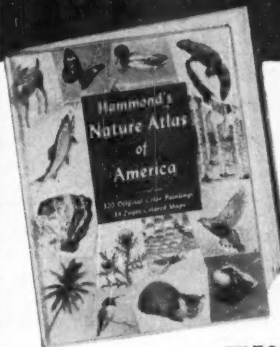
Grass, Our Greatest Crop. By Sarah R. Riedman. New York. 1952. Thomas Nelson and Sons. 128 pages. Drawings by Glen Rounds. \$3.00.

We are inclined to take grass for granted, at least until we do not have it. Yet the grasses are certainly our greatest crop, for the grasses include many grains. So the author presents a picture of the grass family, from the lawn grass to the wheat field, and shows the importance of grass to the retention of our soil and its fertility.

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Devoted to the Practical Conservation of the Great Natural Resources of America

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Briefly Noted

For Boys Only. By Frank Howard Richardson, M.D. Atlanta, Ga. 1952. Tupper and Love. 91 pages. \$2.75.

An excellent, straightforward and sound discussion of the mysteries of manhood addressed to boys by an eminent pediatrician.

The Yugoslans. By Z. Kostelski. New York. 1952. Philosophical Library. 498 pages. Illustrated. \$4.75.

This history of the Yugoslav people from the days of the Romans to the days of the Russians is interesting reading.

Space Travel. By Hal Goodwin. Illustrated by Clifford Geary. New York. 1952. Garden City Books. 192 pages. \$1.25.

A "Real Book" in the series aimed at younger readers, this one about a fascinating subject.

Thanks to the Trees. By Irma E. Webber. New York. 1952. William R. Scott, Inc. 60 pages. Illustrated. \$2.00. Introduction to trees and their use and conservation, emphasizing ecology in simple terms and "A Young Scott Book."

Manly, the Mantis. By Burr W. Leyson. New York. 1952. E.P. Dutton. 64 pages. Illustrated with photographs by the author. \$2.50.

Splendid photographs and brief popular text tell the life history of the spectacular and interesting praying mantis.

Science and Hypothesis. Science and Method. By Henri Poincaré. New York. 1952. Dover Publications. 244 pages and 288 pages, respectively. \$1.25. bound; \$2.50, clothbound.

Translations of two works by the eminent French physicist.

Stars in the Making. By Cecilia Payne-Gaposchkin. Cambridge, Mass. 1952. Harvard University Press. 160 pages, plus 67 plates. \$4.25.

A new vivid portrait of the heavens by one of the leading astronomers of our time presenting new knowledge that has come from use of atomic physics and spectrography to penetrate the mysteries of the cosmos.

Animal as Friends and How to Keep Them. By Margaret Shaw and James Fisher. New York. 1952. Didier. 208 pages. Illustrated. \$3.50.

Two British authors collaborate to provide information on the care of animal pets of many kinds.

Little Ship Astro-Navigation. By M. J. Rantzen. New York. 1952. Philosophical Library. 160 pages. \$4.75.

For the navigator who travels by the stars and other heavenly bodies.

Children of the Blizzard. By Heluiz Washburne and Anauta. New York. 1952. The John Day Company. 192 pages. Illustrated by Kurt Wiese. \$2.50.

Fiction story of Eskimo life based upon the childhood experiences of one of the authors, Anauta, a Baffin Island Eskimo.

Geography of Living Things. By M. S. Anderson. New York. 1952. Philosophical Library. 202 pages. \$2.75.

A book dealing with the branch of geography that connects the physical side with the human side, or Biogeography.

Better Health with Culinary Herbs. By Ben Charles Harris. Boston. 1952. Christopher Publishing House. 182 pages. \$3.00.

The value of the herb garden as a contributor to human health.

Evolving Universe. By Rufus S. Phillips. New York. 1952. Philosophical Library. 177 pages. \$3.75.

Mankind's relationship to universe and earth, explaining earth's purpose and what caused it to evolve.

Solving the Riddle of the Universe. By Arthur A. Walty. New York. 1952. Philosophical Library. 447 pages. \$6.75.

After research for the ethics, the writer presents a wholesome philosophy, and a practical one, of life.

Flickerings

Flickerings. By Madge Acton Mansfield. Boston. 1951. Bruce Humphries. 96 pages. \$2.50.

There are many Nature poems in this attractive collection of this poet's work. She appears particularly to be a dog lover, if we may judge by the number of dog poems included, and her appreciation and understanding of the outdoors is deep and sensitive. She likes the heavens, too, as witness her quatrain entitled "Unhindered" and which says:

"I plucked a bunch of gems, on high,
They were the stars that ships sail by,
But, quick, I tossed them back — that
then
Still, might the ships sail seas, again."

Shell Guide

A Field Guide to Shells of the Pacific Coast and Hawaii. By Percy A. Morris. Boston. 1952. Houghton Mifflin Co. 220 pages. Illustrating 502 species, 99 in full color. \$3.75.

This is the latest addition to the fine and growing Peterson Field Guide Series edited by Roger Tory Peterson. This is a companion volume to the same author's guide to the shells of the Atlantic and Gulf Coasts. With its concise and popular descriptions and excellent illustrations, this book is designed to be taken along whenever one visits the seashore. It is entitled a "field guide" and it is just that.

Insect Book

The Real Book about Bugs, Insects and Such. By Jane Sherman. New York. 1952. Garden City Books. 192 pages. Illustrated by Kathleen Elgin. \$1.25.

This is one in a series of "Real Books" about a variety of subjects and directed toward the younger audience as an introduction to the subject. The world of insects is, of course, as varied as it is fascinating, and the author of this book has chosen some of the more dramatic and interesting insect forms as a means to stimulating youthful interest in this field.

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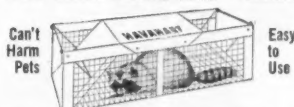
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By Way of Report

THE Seventh Annual Meeting of the Natural Resources Council of America was held at Okefenokee Swamp Park, Waycross, Ga., on October 10, 1952. Our Association was represented by its Vice-President, Harry E. Radcliffe, who was re-elected Treasurer of the Council.

Pollution abatement, conservation education, recreation, protection of parks and wilderness areas, and many broad conservation problems were discussed. Since the Natural Resources Council is a service organization, the action on these problems is left to the action organizations comprising the Council.

The Council had offered its services to the Ford Foundation in the development of a broad conservation program for this country. It was reported, however, that the Ford Foundation will set up a new corporation — "Resources of the Future" — rather than carry out its conservation objectives in cooperation with the Council. Plans have been made to begin this work with a White House Conference on Resources of the Future in March, 1953.

On October 9, the day prior to the business meeting, delegates were guests of the Okefenokee Association, Inc., and had an opportunity to view the park and to learn something of the wildlife that abounds in the swamp area. On the October 11, the delegates were the guests of the Fish and Wildlife Service and spent the day deep in the vast area of the swamp, comprising the wildlife refuge administered by the Fish and Wildlife Service.

The total area, embracing nearly 700 square miles, is largely shallow water, covered with aquatic flowers, and bordered by moss-bearded trees. The Suwannee River, made famous by Stephen Foster, rises in this area. It is difficult to describe its mysterious beauty of cypress, Spanish moss and trembling earth. It must be seen to be appreciated fully. Egrets and ibises take wing in the narrow lanes between cypress trees as one approaches — there are more than eighty species of birds in the swamp.

Okefenokee primeval wilderness has qualities that make it virtually of National Park caliber and the area deserves the same vigilant guardianship by the people of America that today is accorded our National Parks.

PUBLIC appreciation of the American Nature Association's Arizona Desert Trailside Museum project in Tucson is evidenced by the fact that more than 16,000 persons visited the Museum in the first month after it was opened in early September. Reports from William H. Carr, director of the project, indicate that final construction of the outdoor pits will soon be completed and that most of the other installations are done. Located only 14 miles from Tucson, the Museum is in rugged Tucson Mountain Park. Its basic objective is education with respect to the flora, fauna and geology of the area and conservation of natural resources. Arthur Newton Pack, President Emeritus of the American Nature Association, took the initiative in launching this project, with the cooperation of the Pima County Park Commission.

Membership Application Blank

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Contents Noted

ALTHOUGH conservation has been a part of the Camp Fire Girls program for many years, the Birthday Project for 1953 of this organization will be entitled "Down to Earth," and will have as its object intensification of interest in conservation. One of the greatest assurances for the future lies in the emphasis that groups of this kind are placing upon an early appreciation of the importance and wise use of our natural resources. Through such programs we are creating an informed generation that is growing up with a knowledge of natural resource values and their interrelationships. In the Camp Fire Girls Birthday Project attention will be focussed on conservation problems of local character and thus significant to the participant, providing a sound basis for understanding conservation needs in the large. We will cooperate in every way possible in aiding this program.

INDICATIONS are that we soon may be able to remove the trumpeter swan from the list of bird species facing extinction, but it is unlikely that this magnificent bird will ever be other than a rigidly protected species. In 1935, count of trumpeters show a woeful low of 73 birds. Heavy shooting, trading in the down and breast skin of the birds, and destruction of natural breeding areas had brought the swans to the edge of oblivion. That year Red Rock Lakes Migratory Waterfowl Refuge in Montana was established to provide the trumpeters inviolate habitat, for the reduction in numbers had continued despite protection by law in 1924. As the numbers of the swans increased some were transplanted to establish breeding colonies on the Malheur National Wildlife Refuge in Oregon and the Ruby Lake National Wildlife Refuge in Nevada. Now the Fish and Wildlife Service announces a count of 571 birds, including 68 in Yellowstone National Park, after the 1952 breeding season. This was an increase of 36 birds over 1951. Thus these birds should, barring disaster, give every promise of a small but steady annual increase.

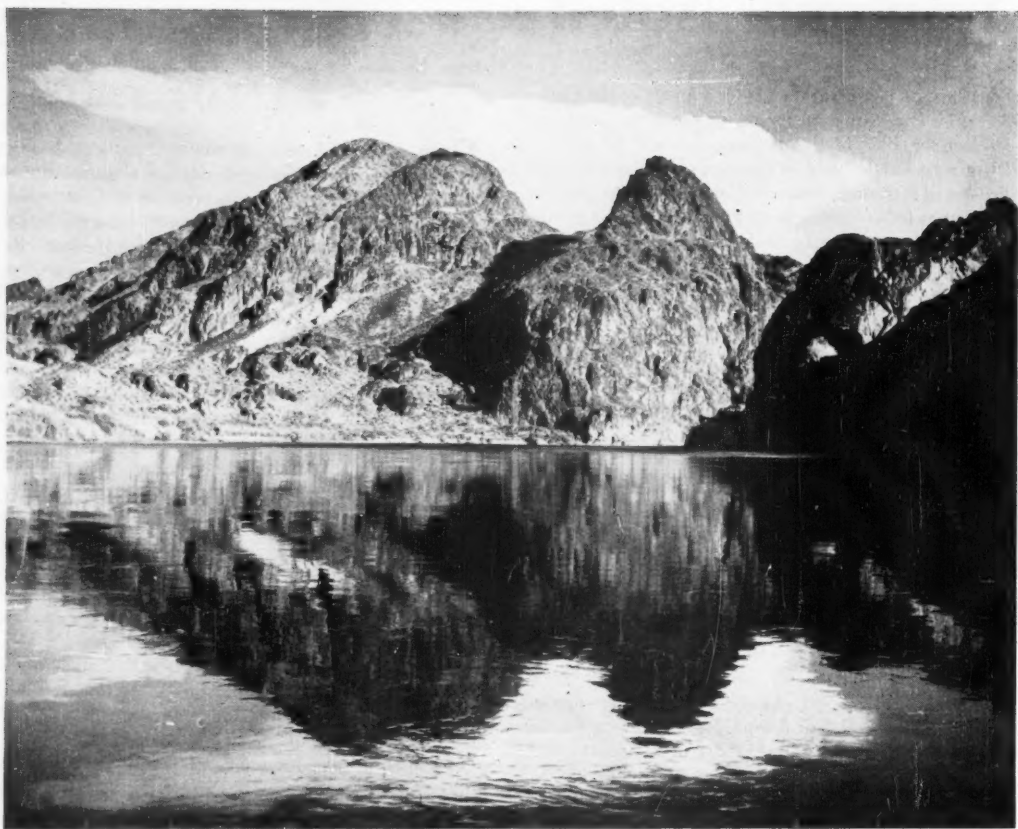
FOR fifteen years the National Wildlife Federation has sponsored an annual conservation poster contest for high school students with artistic bent. This year a variation is announced in the form of a cartoon contest that seeks to achieve creation of a cartoon character that can be used to tell the story of conservation. "Smokey Bear," the successful and beloved character who campaigns for the U. S. Forest Service against forest fires, is the inspiration for this shift of emphasis. The Federation announces that all entries must be original in design but may be a caricature of an animal or person, or the personification of an animal character. Whether a symbol that can achieve the eminence of "Smokey Bear" can be created is a matter of conjecture,

but certainly it is worth a try. The inventiveness of the youthful mind may well succeed in producing what is sought. Rules and other information are available from Cartoon Contest, National Wildlife Federation, 3308 Fourteenth Street, N.W., Washington 10, D.C.

FROM Wendell Lamb, an Amboy, Indiana, biology teacher, comes what he describes and some "mouse-information." His science class rigged some wheels in mouse cages and put a "mouseometer" on one wheel to register the revolutions. He does not say what kind a mouse was at work, but it was found that on a wheel ten inches in circumference a mouse will average 15,000 revolutions a day, which approximates two and one-third miles. He found variation in the playfulness of mice and that younger mice are the most active. One mother mouse ran the wheel at midnight, knocked off for an hour or two to give birth to eleven babies, and was back running the wheel again at dawn.

FROM Fae Boyd, Vandura, Saskatchewan, Canada, comes some more "mouseinformation." A nurse, she was hurriedly called away and left a basement window open. When she returned, several days later, she found the house overrun by mice, field mice, she thinks. In her blanket drawer she found a complete mouse nest, ready for young, established on a blue blanket. Miss Boyd's soldier nephew had made her a tufted woolen cushion of dark green, yellow, red and pink yarn, which was in a top drawer. The mice had taken eight small balls from this and piled the many colors in a mound. From downstairs they had brought absorbent cotton for a white base and mixed this with some pink yarn, mostly on top and fluffed out like wool. It was such a lovely and tasteful structure that Miss Boyd was tempted — but not too long — to leave it. Describing it to her soldier nephew, he suggested that the mice were specially smart and must have expected all girls.

DECISION of the United States District Court of Minnesota upholding the Executive Order of December 17, 1949, prohibiting planes from flying at altitudes of less than 4000 feet over the Superior National Forest, is a victory for the amenities, so often the victims of special demands and what is so often described as "progress." The area affected is a unique wilderness, the land of the early canoe routes of the Indians and the Voyageurs. It is a country of lakes and waterways, roadless and a symbol of primeval America. It is to be hoped that it will remain so, and that future generations may be able to point to the wisdom of today in setting aside the great Quetico-Superior international wilderness. The airplane, following World War II, began increasingly to invade this area, carrying passengers and cargo to privately owned lodges within the region. It was to check this violation of wildness that the Order was issued. R.W.W.

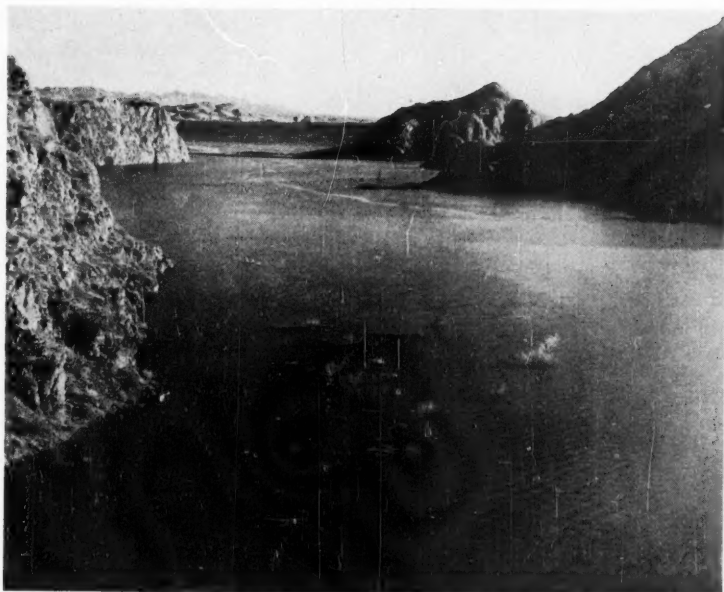


PHOTOGRAPH BY BELKNAP

New Lake Mohave. All large forms of wildlife were driven into the hills. Wild burros were too smart to be caught by the waters but must compete with bighorn sheep for food.

NATIONAL PARK SERVICE PHOTOGRAPH





PHOTOGRAPH BY THE AUTHOR

Flooding the valley immediately behind Davis Dam to make Lake Mohave. This portion of the lake filled immediately after the flood gates were closed and the water backed up.

Birth of A Lake

By RUSSELL K. GRATER

FEBRUARY 12, 1950, started out just like any other late winter day in the desert country — mild, with just the right amount of snap in the air, and miles upon miles of visibility. Before the day ended, however, drama had swept across the lowlands along the lower Colorado River as a man-made flood began to inundate the broad valleys and washes. On that day the water gates at Davis Dam — the latest in the series of giant dams thrown across the Colorado River — were closed and 65-mile-long Lake Mohave was born. Hailed as a great step forward in the "battle for water" campaign being waged in the Southwest, the closing of the gates brought with it tragedy and a mad scramble for survival among the wildlife of the region.

The formation of a desert reservoir is an event of unusual interest to watch. In its first stages, the water rises rapidly and all sorts of things happen within the area being flooded. As the water invades the low-lying flats near the river, the small mammals and reptiles occupying the vegetated areas are soon forced from their homes. A quick death by drowning is the fate of many; others are pushed into washes almost devoid of cover and food, there to survive for one or more nights until some hungry coyote or fox

stumbles upon them. It is after this initial dramatic flooding takes place that the real story of a reservoir formation begins.

At Lake Mohave, a part of the Lake Mead National Recreational Area, the National Park Service chose a broad basin known as Cottonwood Valley as the best place to watch and study the effects of the formation of the new reservoir. This valley was of unusual importance from the standpoint of wildlife. Its gently rolling terrain was covered with a dense jungle of thorny mesquite trees and catsclaw, with most of the available open space occupied by seed plants. It was a paradise for small mammals and birds, and the presence of so much food lured predators into the area in large numbers. A part of the valley had been under cultivation for many years, and a few ranches were once scattered along the banks near the Colorado River. In some places canals had been dug, bringing water from the river into the rich valley to irrigate fields of hay. This, then, was the situation when the waters of the new lake began to spread slowly across the lowlands.

Low sandhills, usually topped with mesquite trees, were dotted across Cottonwood Valley, and these soon



NATIONAL PARK SERVICE PHOTOGRAPH

While no bighorns were actually trapped on islands in Lake Mohave, they are numerous in the canyons adjoining the lake and their food problems became acute when the lowlands were flooded.

became temporary havens of refuge for the small animals of the region. Forced to flee as the water invaded the brushy flats, hundreds of wood rats, kangaroo rats, rabbits and other small rodents headed for the nearest high point of land — only soon to find this highland area transformed into an island as the water closed in from all sides. There could be only one end — death for the island's small inhabitants. The form death followed might differ, but the end result was the same. Some of the larger animals trapped by the water, such as ringtails and foxes, lived a life of unprecedented ease for the next few days, as more and more small rodents crowded upon the shrinking top of the island, furnishing an abundance of food. Soon even the predators were faced with the prospects of a watery grave as the land slowly covered and became part of the reservoir floor.

On other islands, the rodent refugees were relatively free from the predators, but subject to equally grim circumstances. Here the race was between starvation and drowning. One such island, less than twenty feet across, was found to contain a total of fourteen cottontail rabbits, and an undetermined number of kangaroo rats and pocket mice. Food had become practically

non-existent when the island was discovered, and the rabbits were eating the bark from low mesquite trees by climbing up among the lower branches. Even the invasion of the island by naturalists of the National Park Service failed to excite them very much, and they went methodically about the business of bark stripping within five feet of photographers. Human beings apparently represented much less of a threat than did the pangs of hunger. Although the island was small, the rabbits and other small rodents were too agile to be caught among the brushy cover. Plans had been made to capture them, put them in large cardboard boxes brought along for the purpose, and transport them to the mainland, there to be released. As the water was coming up rapidly, it was decided to return the next day when the island would be still much more reduced in size and attempt the removal of the animals. However, Nature took matters into her own hands and during the night high winds arose, causing waves that swept away the last bit of land, and with it the island's inhabitants. Only the stripped branches of the mesquite trees were to be seen the next morning, mutely marking the final resting place of the furry victims.

On another island the naturalists found an entirely different situation. Here a family of beavers had taken refuge beneath a dense canopy of low mesquite trees. Driven from their bank dens along the edge of the river, they were obliged to use whatever cover they might be able to locate. As the boat approached, the two old beavers left the brushy top of the island and took to the water, keeping the land always between them and the boat. Not so the young beavers, however. They were only a few months old, and apparently had nothing yet in their experiences to cause them to fear people. They displayed a keen curiosity about what was going on, and one of them obligingly posed for pictures at less than six feet. Only when pressed too closely did these golden-furred animals take to the water. The family stayed on the island until forced out by the rising waters, living on mesquite bark, and cutting small branches with which they built a low platform in the bushes upon which to rest while watching the water creep upward. Even this platform finally washed away, leaving the animals no alternative but to go to the lake shore and try to find protection in holes among the rocky walls.

It was upon a small, sandy, flat-topped point of land that we had the most interesting experiences. Here were a few scattered boulders, while numerous holes, dug by small rodents frantically trying to hide themselves from hawks that ranged the region, dotted the area. This was an excellent place to learn something about the mammalian population of the region, and so



PHOTOGRAPH BY THE AUTHOR

Ringtails were occasionally trapped by the rising waters. Common in the river valley, they had little difficulty living off the small animals trapped with them.

a shovel was brought ashore to do a bit of digging. A camera was set up to record the event, and the first shovel of dirt was turned. Immediately there was action, but not of the sort expected. Instead of small rodents scurrying from the hole, the sand seemed suddenly to explode as the maddest bull snake anyone would want to meet emerged to face this new threat to his peace of mind. Driven from his brushland home, pushed steadily upward by the rising waters, he was likely in no mood to argue about the situation any farther. His whole attitude was one of "lets fight and get it over with right now!" While he was not capable of doing any damage, he did give the photographer a fine show for the movie being filmed. Nor was he the only scaly inhabitant of the island. Further digging also brought to light a number of lizards, all stolidly awaiting whatever fate had in store for them, and exhibiting little interest in the whole proceedings. The small mice and kangaroo rats dug from their shallow shelters forlornly drifted around the island, utilizing any bit of cover that might be found, fearfully eyeing the human invaders and obviously expecting to be attacked at any moment. To catch them was really no great problem. Lacking any ground cover, each animal would soon take to the lake in a last desperate attempt to escape. Helpless in the water, each was easily captured and placed in boxes for transport to the mainland. Here they were released to take their chances against the numerous foxes and coyotes patrolling the lake shore.

As might be expected, it was not uncommon to find rattlesnakes on the islands. It was somewhat of an eerie feeling slowly to beach on a point of land and hear a warning buzz, or perhaps more than one, rise from the depths

of a brushy area. Rattlesnakes were usually not too ill-tempered. They seemed to sense that something was wrong, but, outside of being a bit uneasy, they appeared to have decided to wait it out and see what was going to happen. There was plenty of live food trapped with them, so they ate well. As a last resort a rattler could always swim to shore, although he did not take to the water too willingly.

Although none were marooned on any of the islands, such large mammals as bighorns and wild burros were

A cottontail sits a bit disconsolately while the waters of the lake approach from the side. Many of these animals perished when the islands were flooded.

PHOTOGRAPH BY THE AUTHOR



vitaly affected by the rising waters. The heavily vegetated slopes adjacent to the river once offered an abundance of plant food, conveniently located near good drinking water. Now all has been changed, and bighorns must range over a considerable area in order to obtain a sufficient supply of food. With less available food than before, with sharp competition for this meager supply by wild burros, the bighorns faced a real problem in maintaining their normal way of life.

While the Colorado River Valley was an important habitat for water fowl and wading birds before the rise of the lake, it quickly became a land of plenty for thousands of birds as the water inundated the region. Such birds as the egret, white pelican, green heron and goldeneye duck — all of unusual occurrence in this area — were observed in fairly large numbers, while the more common types of diving ducks and shallow water feeders invaded the new lake in droves.

The immediate effects of the flooding water were obvious — destruction of their homes and death to hundreds of small creatures. Thus it was the destructive effects of the new reservoir that posed the most serious problem from the standpoint of wildlife.

The beaver population was clearly among the hardest hit. These animals were bank dwellers, and, as such, did not build dams or lay up food stores of any consequence. They were dependent upon such plants as cottonwood, willow and arrow-weed — plants that either were destroyed by burning before the lake was formed, or by flooding as the lake came up. There was much concern felt regarding the ability of the beavers to find food and shelter during the months required for new food plants to take root around the new lake. An attempt was made by wardens of the Nevada Game and Fish Commission to relieve this situation a bit by live-trapping some animals. Only one was captured but the method used was of interest. Locating a beaver hiding along the lake shore, the wardens made it take to the water. Then followed a game of hide and seek, the beaver diving to elude the wardens' boat; the boat being maneuvered so that it was near the animal when it came up for air. Soon the beaver became tired, and was easily lifted from the water by its tail and dropped into a container. It was then taken to a stream in northern Nevada and released where food was plentiful. Long range plans to aid in producing food for the current beaver population have been devised by the National Park Service. These plans call for the immediate planting of hundreds of cottonwood slips at selected places along the lake at high-water level. Such planting would insure a good source of food and growth, which would mean valuable ground cover.



PHOTOGRAPH BY THE AUTHOR

A beaver, found on one of the islands, sits unconcernedly while his picture is taken. This was one of a family of five found on one small point of land.

Whether this program can be accomplished soon enough to preserve the beaver now remaining on the lake is still uncertain.

In like fashion, such animals as muskrats and otters, (a rare species on the lower Colorado,) are confronted with the new environment created by the new lake. The otters will likely adapt themselves rather quickly, as fish food in the lake is plentiful. Such may not be the case with the muskrat, however, as the marshy areas are now gone, and with them his principal food sources. Pushed back out of the valleys were hundreds of quail, and, while they are also to be found in a few protected canyons in the mountains above the lake, their main numbers were concentrated in the brushy lowlands. With the chief source of food and shelter gone, the birds must automatically experience a sharp drop in abundance.

The future prospects for wildlife around Lake Mohave are variable. (Continued on page 550)

Land of the Snowshoe Hare

By
VIRGINIA
S. EIFERT



The snowshoe hare is one of the most important animals of the north country.

THE WHITE rabbit made enormous leaps down the snowy trail and bounded into the sheltering balsams. Behind it were left imprinted a series of footprint hieroglyphics that told a tale of survival in the north.

The land of the snowshoe hare is the coniferous forests and aspen woods of the northern states and Canada, in winter places of deep and abiding snow. Winter begins in October and lasts until April, sometimes until mid-May, so that for at least five months of the year the ground is white and the drifts grow deeper with each snowfall and with each day of wind. Endlessly, it

seems, in an annual recurrence of a glacial-era atmosphere, the forests of the north lie white and deep and cold.

Far from cities, it is a land of clean sparkle, hip-high drifts and exhilarating cold air. It is a country of whiteness accented by dark conifers rising from snow, and the white-on-white of birches, of the broad expanse of frozen lakes, of muskeg hummocks smoothed out now under a level white crust, of the black water of a rapid creek swirling between curved white banks. It is a land that is reduced to its lowest ebb of supporting life, yet life, in spite of below-zero temperatures and those five long months of snow, adequately manages to be supported. It is true that many of the forest creatures are not abroad to compete for the small amount of available food. The sleepers are asleep — the bear, the woodchuck, the chipmunk, the raccoon, the skunk — and perhaps three-fourths of the birds found here in June have gone south. The deer have gathered in to the yards and cedar swamps where food is more assured than it is among deep drifts. There still are the lively squirrels, notably the reds, depending mainly on the seeds of the conifers. Many birds that are here subsist on high-held, ripened seed crops in the conifers, alders, and birches. It is a land of seed-eaters, of birds that find sleeping insects or their eggs in crevices of tree bark, or meat-eaters that somehow manage to find enough unwary creatures to stave off that perpetual hunger.

PHOTOGRAPH BY THE AUTHOR

"It is a country of whiteness accented by dark conifers rising from snow, and the white-on-white of birches. . ."





PHOTOGRAPH BY THE AUTHOR

"It may go gaily across a frozen lake, through forest or bog, and leave sharply imprinted footprints in the soft snow."

The owls, foxes, wolves, coyotes, weasels, and lynxes have a grim and urgent battle all winter long to find enough food for survival. In a land as cold and snow-covered as this, it seems impossible that there could be food enough to go around.

And then, out of a thicket there jumps a big white rabbit with black-rimmed ears and black eyes, a rabbit that leaps prodigiously down the trail and turns into the balsams. Here is the answer to the meat-eaters' problem in the winter north. Here is the snowshoe hare.

The varying hare or snowshoe hare of the American north is usually abundant enough to provide hungry creatures with food and yet perpetuate its own kind through another dangerous year.

The hare is one of the most important mammals of the north country. It has been used as vital winter food ever since there were hungry creatures sticking out the winter in the forests — the wild creatures themselves and the Indians who must depend largely on rabbit meat and rabbit fur all winter long. Yet its importance in the adequate balance of life, in a land that is stripped down to essentials in order to support life when spring comes, makes the snowshoe hare perhaps the most important key creature in the ecological scheme.

When there are enough varying hares, the owls, wildcats, coyotes, and wolves are kept at a normal abundance, which is seldom greater than the balance requires. For there must be predators to keep down the numbers of creatures like the hares, whose multiplication is endless and whose appetite is enormous.

The predators naturally take a heavy percentage of hares. The surviving hares girdle great numbers of young trees in the forest, and especially young willows along the stream borders. But willows are prolific growers, and any loss of saplings is soon replaced.

But the balance shifts about, and about every ten years something happens to the snowshoe hare. Its populations follow approximately a ten-year cycle of increase and decrease, which is as yet not thoroughly understood, although it is now believed to be caused by disease. After a year of peak numbers, when there seem to be hares all over the country, there is a definite although gradual decrease in numbers. At the lowest ebb the numbers begin to increase again, so that at the end of the period their numbers again become as great as ever. It is as regular as clockwork, regular as the calendar, regular as the hare's annual change from brown fur to white fur.

When the snowshoe hare populations are down, the meat-eaters know trying times. The foxes are leaner than ever and many owls are hard-pressed. The snowy owls, during such a crisis, migrate silently on white wings southward into more populous lands where other food is available. Others of the larger predators are driven by hunger to attack other animals, which, in times of normal hare populations, usually are let alone. It is a grim, cold winter at the best, but when the snowshoe hares are scarce it is even more grim and colder for many of the larger creatures.

With so many hungry ones about, the hare needs all its resources to survive. Its annual change from brown to white is one of its greatest assets in a land where many of the creatures larger than itself are anxious for a meal of rabbit. The growth of white hairs and the gradual shedding of the brown take place over a period of about ten weeks, and for a time in late autumn the hare is mottled brown and white. But by the time the permanent snows have come to the ground, the hare is a ghost bunny, pure white or a bit smudged, the black ear-rims and black eyes standing out darkly against the drifts. Now, when the winter sun is bright, the hare's shadow on the snow is more conspicuous than the animal itself.

At the same time that the fur changes from dark to white, the large feet are made even larger and longer and broader by reason of coarse, long hairs, which provide a snowshoe-like base that holds the hare on top of the snow. In great, light-heeled leaping, the snowshoe hare is on its way. Here is the greatest speed in all the northern forests. At thirty miles an hour the hare zips far ahead of the fastest dogs. But in this racing over the crust and through the balsam woods, over swamps under which the muskeg is deeply frozen, the snowshoe hare seldom goes more than a few hun-

dred feet from the spot it knows as home. Its usual course lies in circles that always bring the hare back to its starting place.

In the hilly balsam country toward the south the rabbit highways lie above frozen bogs and lakes. So many hares have come that way that their chubby tracks have beaten down lanes through the snow. The animals stand on tiptoe as high as they can reach to peel off the tender bark of young red maples and pines; aspens are nibbled; even the raspberry canes in the old lumber clearings are pruned by hares' teeth. To get about in soft snow the hares beat down these lanes much as the deer use their deep mazes cut in the deer yards down in the cedar swamps. But the individual hare is not confined, as are the deer, to lanes. It may go gaily across a frozen lake, through forest or bog, and leave sharply imprinted footprints in the snow.

Night is the chosen time to go about, and in moonlight the hares sit about meditatively, as though bewitched by this silvered winter forest. Some leap about in gay cavortings, then pause thoughtfully for a long, long while. Or, on a night when the temperature lies at twenty below zero, and the moon seems an icy presence above the forest, one may sit up on its haunches and, with paws pressed against a heaving breast, mystically eye the moon.

At last the long winter passes. It is thawing time, sugaring time, the time of the break-up of the lakes and the return of robins. May, and at last spring, is signalized in birch catkins and alder tassels, in shad-bush flowers, and the perfume of arbutus on a bank above the bog. Although the snow has been gone for only two scant weeks, all the puddles and bogs are loud with hyla voices. And the snowshoe hare is brown again. Since late winter, for ten weeks or so, the hare has gradually changed its coat. For a while it was mottled brown and white, as the winter white fell out and was replaced by summer brown. And on a spring day when the pink moccasin flowers are in bloom and the balsam tips are full of pollen, baby hares are born in a tussock of old bracken stalks and grass, or in similar surroundings.

Young hares are born fully furred and their eyes are



PHOTOGRAPH BY THE AUTHOR

"...the black water of a rapid creek swirling between curved white banks."

open, unlike baby cottontails, which are born blind and naked. The little hares cuddle together in a fur-blanketed nest and the mother lurks nearby, but seldom approaches the nest until night when she comes to feed them. In a few days the young are able to leave the nest, and at this time in their precarious lives they are in the most danger. They seem completely defenseless in a land in which all meat-eaters relish tender morsels such as these. Yet somehow many survive. Out of the four or five litters in a year, the hare population is well maintained.

The cycle of the year moves on. Now in the dusk of June, while the hermit thrushes chime their last sweet minors among the pines, a snowshoe hare moves on plushy feet around the corner of a log cabin in the wilderness and lopes down the soft sand road. The animal pauses for a long time, is only a darker blot on the darkening road, listens, sniffs, twitches its ears, and then with a few loud and decisive thumps of strong hind feet — a mystic signal — lopes on into the night,

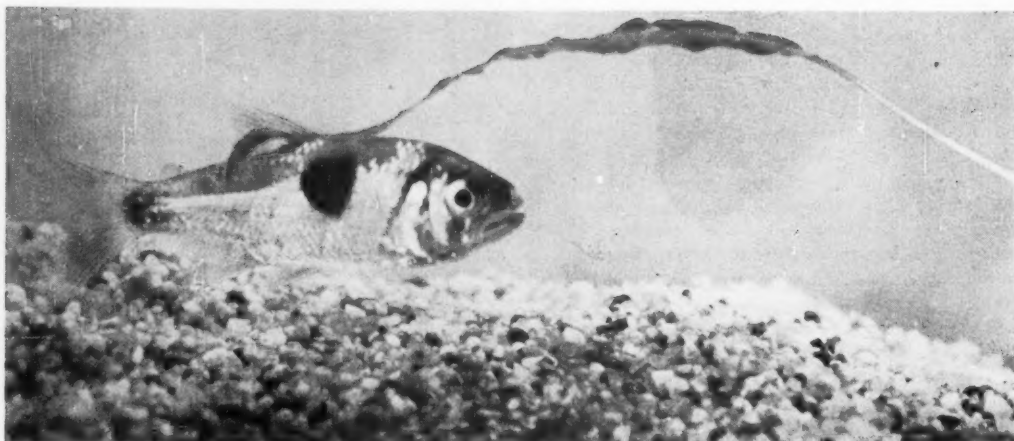


Fox in A Trap

The February gale is sharp and raw.
The starving fox, abroad this freezing night,
Who hears the snap, then feels upon his paw
The trap-jaws close with their inhuman bite,
Was hurrying to reach his snowed-in den,
For more snow threatens on the bitter, fresh
And lashing wind. He tries to run, and then

By E. V. GRIFFITH

The trap-chain jerks him back with rended flesh.
He struggles to get free. The steel jaws hold.
The ominous darkness clocks his failing breath
As sharp, incisive bayonets of cold
Stab him . . . A blizzard, full of icy death,
Commences, snuffing out his whimpering cries,
And blown snow drifts across him when he dies.



PHOTOGRAPHS BY JACK L. LEVY, AQUARIUM STOCK CO., LOS ANGELES

Exodon paradoxus is an attractive and not too common aquarium fish from South America. It is a rapid and graceful swimmer, combative with its own kind but amiable with other fishes in a community tank. The intense black spot on the silver sides and the smaller spot at the tail are distinguishing coloration.

Exotic Fishes at Home

By MANUEL WEISS

SINCE the year 1868, when the Paradise fish excited the tropical fish fancier with its remarkable nesting habits in the rice paddies of China, aquarists have endeavored to raise and breed miniature fish in small glass tanks. Whatever their success, the courting and mating conduct of more than one thousand tropical species introduced during the past half century remain the most interesting of their many fascinating habits.

These midget fishes come from many parts of the world, and appeal to many on a par with such household pets as dogs, cats and birds. They come in a variety of shapes and coloring, some more startling than any Disney creation. Many of them are related, yet have habits quite different from their cousins. Some are savage and unapproachable in spite of their small size. Others are as peaceful as a flock of lambs. In the home aquarium they live, court and die without the major adjustments necessary in their natural environments.

Commercial dealers of exotic fish hesitate to guess the exact number of tropical fish fanciers in the country today. But, judging from gross sales of about \$6,500,000, they modestly estimate 5,250,000 fanciers.

The amateur starting a tank of tropicals is perhaps as green as a blade of grass. Recently I overheard a conversation in an aquarium shop. It was obviously that of a beginner, who asked the manager of the shop to prepare an aquarium for him, so that he could impress his future mother-in-law. It may be that aqua-

riums get started for similar odd reasons. However, after several months, when the mated female fish delivers ten to thirty live babies only to eat them immediately, the novice fish fancier will delve into ichthyological lore for aid. Then he will find himself truly introduced to a fascinating hobby.

Those who ride such hobbies, whether they be rock hounds, stamp collectors, cave explorers, or tropical fish fanciers, have strong common bonds. Experience has shown me that enough fish tales can be swapped to kindle a friendship for life. Friends, in turn, will recommend the addition of this or that fish, for its unique habits or coloring, or swap information and specimens. The living room furniture may then have to be moved to make way for another tank or two. A famous radio comedian told me his aquatic hobby had kindled his interest to the point of exclusively breeding his own exotic fish.

Aquarists who, after the first-time mating of their fishes, are mystified by the sudden disappearance of eggs or fry, will learn the techniques used by breeders in protecting the fry from their parents. In the case of live-bearers, plant the aquarium thickly with aquatic plants. This covering serves the young with quick hiding places from hungry parents. Removing the parents is another effective method. In the case of egg-layers, spread a double layer of pebbles on the aquarium floor and drain off water to a depth of five inches. This keeps the parents from eating the falling eggs and also serves to hide the eggs from the hungry

adults. For the fish that lay adhesive eggs, simply place a tray of plants in a clear tank, removing the tray after the eggs have been laid.

In Nature, eggs and fry are dropped under conditions wholly different than those found within the confining limits of a glass tank. The love play, combined with the act of spawning, covers a wider area, and the greater part of the eggs, including young, escape the notice of the parents. Of course there are certain aquarium fishes, such as the Cichlids and Bettas, that are model parents.

The Cichlids, occurring mainly in South America and Africa, with several relatives in southern Asia, devote a considerable amount of their time and energy to raising one family after another. They protect their young zealously against any intrusion, and will attack the hand of a man approaching their nest too closely, at least until the young are large enough to care for themselves. The African Cichlids protect their fertilized eggs by carrying them in their mouths until they hatch, a matter of three weeks, during which time they take no food. Even after the fry are hatched, the parents will allow young to swim about them until danger threatens. Then, either parent will open their mouths for the youngsters to enter, and there remain until, in the judgment of the parent, the danger is past.

One of the most fascinating scenes is watching the preparation of a Cichlid nest. Both sexes spend several days cleaning a smooth surface, preferably a flat rock, and, in addition, prepare a shallow hole in the sandy bottom. When this task is completed, the male follows the female, fertilizing the two- to four-hundred eggs that the female neatly drops in rows on the rock. The egg mass resembles a jelly-like substance, each egg the size of a pinhead. Both parents then take up the task of fanning the eggs in order to provide extra oxygen. During this time, if hunger overtakes them, one will leave in search for food, the other faithfully remaining on duty.

One can observe these eggs developing. The speck of an egg slowly enlarges until, on the third day, tiny tails start to wiggle in the water. The hatched fry now want to leave the protection of the parents, but the adults pick them off the rock and carrying the wiggly fry in their mouths to the hole prepared in the sand. The heads of the fry are placed downward, their minute tails up, resembling a mass of vibrating jello. With water temperature above 78 degrees, the fry grow fast, and appear to become impatient to leave the nest. But delinquent fry are retrieved in the mouths of the parents, who spit them back into the nest. When control is finally lost over the growing youngsters, the parents put them into formation, comparable to a swarm of moving bees in flight. They are interesting to watch.



The angel fish, *Pterophyllum scalare*, comes from the Amazon and is one of the Cichlids difficult to breed.

The fry grow rapidly on an abundant supply of microscopic food, and within two weeks are capable of swallowing tiny water insects. In less than one month, the young grow to a half-inch, and are capable of foraging for themselves. The parents lose interest then, and prepare once again for the birth cycle.

The damp lowlands of Asia have provided the fanciers with a curious tribe called the labyrinth bubble-nest builders. These include the Paradise fish and the famous and beautiful *Betta splendens*, better known as the Siamese fighting fish. The latter has become famous for its gladiatorial contests in the licensed gaming houses of Bangkok. The sport consists of putting two pugnacious males into a small glass container, which is an invitation to combat. Mutilation of the fins, or even death, often results, and the victor is the one still eager for battle. Some of these fighting fish have been known to continue attack for as long as six hours.

The Bettas are best known for their rich red, deep blue-green and fleshy pink bodies, and the intense coloration of the flowing anal fins, often larger than the fish itself. They breed freely in captivity and exhibit a most exciting mating.

Bettas spawn best, during summer or winter, in water above 70 degrees. They exhale air in the form of bubbles during spawning, covering an area at water level the size of a hen's egg. The male gently maneuvers

his lady under the nest, fertilizing the many hundred eggs as they drop. The duty of the female is completed so far as she is concerned. The male picks up the fallen eggs and deliberately places them in the air nest. The female would love to eat her own eggs, but the male, being much larger and jealous of his parental prerogatives, is constantly watchful and will drive his mate away. To save her life and the nest, it is wise to remove her.

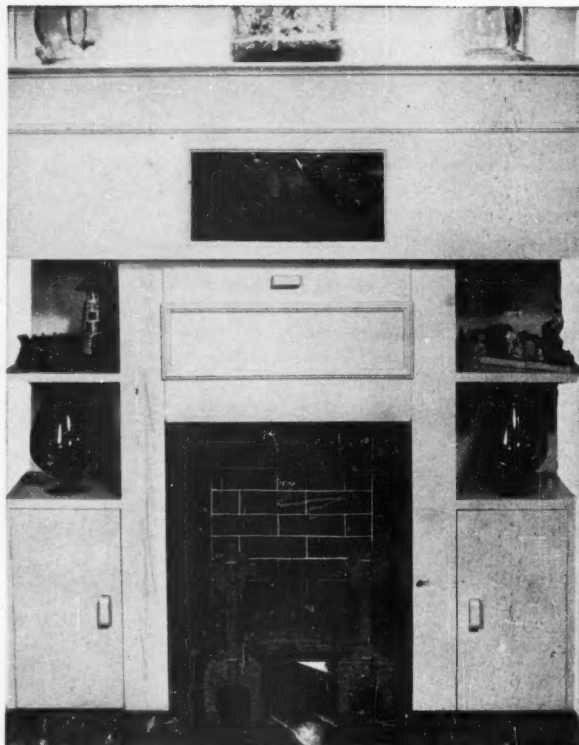
The male, left to his parental task, further protects the eggs by blowing fresh air bubbles wherever needed. The next two days, during the hatching period, the father, still concerned about his offspring, will bring back to the surface fry that happen to fall to the tank bottom. The nest deteriorates at the end of the hatching period.

The live-bearers are so named because they produce live fry. All these species occur in the tropical and sub-tropical Americas and the West Indies, and include the Mexican sword-tail, guppy, the platys and the mollies. They are well suited to the aquarium and are beautifully colored. Most of them mature at six months or less, and start delivering broods of youngsters every month or so. The little fellows, hardy and adaptable, grow rapidly, but are easy prey for their hungry parents. The removal of the parents, or use of special breeding traps, avert loss from this cannibalistic trait.

In a properly arranged tank, a satisfactory balance of necessities, approximating those found in the natural habitat, should be provided. Light and temperature are two essentials that should not be supplied indifferently. Too much light will encourage the growth of algae, and too little will inhibit the growth of aquatic plants. Temperature, on the other hand, should always be continuous above 65 degrees, and ordinary room temperature should not be relied upon.

Fishes, of course, live in water and require food and oxygen. Proper supply of these three essentials gives the aquarist the most trouble. In Nature, the food of fishes is primarily live food, such as daphnia and larvae. In large cities, securing live food is difficult, and it hardly pays a dealer to stock it. Raising live food is costly. The prepared food available is a good substitute.

In Nature, ample oxygen is supplied by plants and surface aeration, but in the narrow limits of an aquarium, where often many fishes are crowded together, aeration may not be sufficient. Tiny pumps that act as aerators are available. They press air through a porous stone, the air bubbles mixing with the water on their way to the surface. The pumps move surface water, allowing much more oxygen to enter the water than can possibly make its way through a still surface.

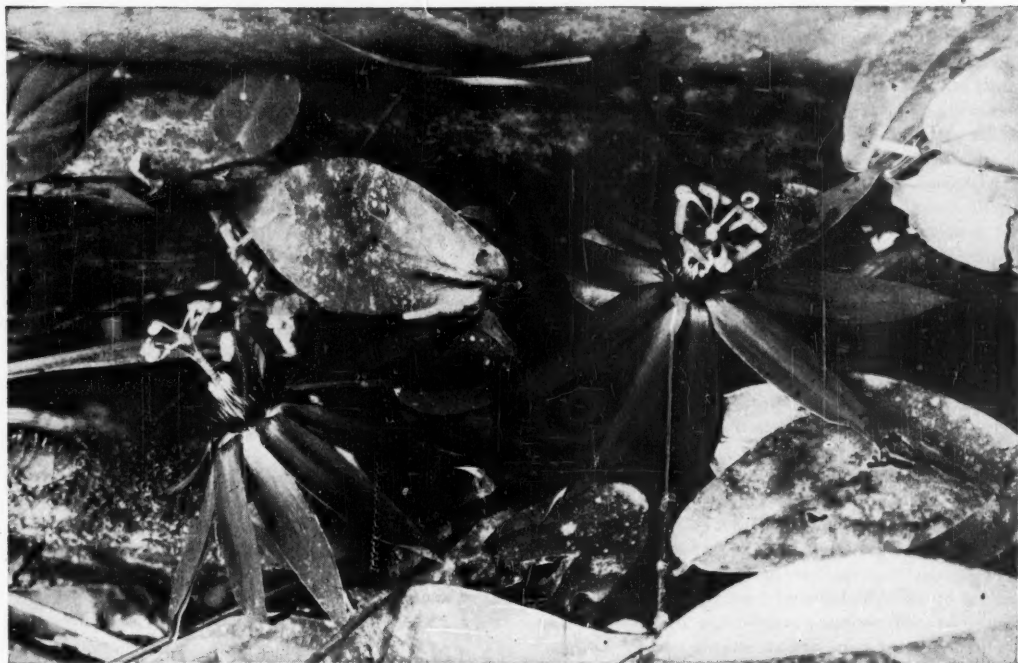


PHOTOGRAPH AUDIE SHARKEY, TROPICAL FISH SHOP, LOS ANGELES

An attractive aquarium installed over a fireplace. Aeration and lighting equipment are behind a false panelling immediately below the tank.

The constant absorption of mineral content from the water by fishes and plants is important. Minerals found in faucet water are quickly absorbed, whereas in Nature, the waters of lakes or rivers are in continuous contact with mineral deposits that replenish the amount of minerals absorbed by animals and plants and essential to their existence.

The last vital factor to consider in creating the balanced aquarium is the tank. The tank should be of a size sufficient to care for the number of fish that can comfortably carry out their job of living. Some midget fish like the live-bearers exhibit strong sex impulses and will not protest against a confining tank in mating. However, if a species is to be bred for size and color, more tank space than the average aquarist often can provide is essential. A typical example of this is the *Mollienisia spheonops*. Large species, when bred in a small tank are influenced by their environment and will tend to produce smaller offspring. A truly large and beautiful specimen is usually one grown in a large tank by some commercial dealer, or one that is imported. The efforts extended toward the achievement of the right balance is not hard, and the end result is rewarding in the following of an aquarium hobby.



These brilliant scarlet passion-flowers, nearly six inches across, blaze forth in the dim light near the ground in the Central American woodlands. The surrounding foliage does not belong to the flowers, but to plants of other species. The passion-flowers are borne on special basal shoots of vines which climb high into the trees and display their three-lobed leaves in the brighter light.

Scarlet Passion-Flower

By ALEXANDER F. SKUTCH

BEHIND my house in Costa Rica rises a steep hillside, where the horses crop the short grass and pick up the aromatic fruits that fall from the scattered, brown-barked guava trees. On its farther side the narrow ridge falls as steeply into a deep vale, where a cluster of tall tree-ferns has been left standing to adorn the pasture with their spreading crowns of intricately divided fronds. Beyond this moist hollow, tall second-growth woods rise up like a wall beside the open pasture. Along the edge of this woodland, during the bright days of January and February, brilliant spots of scarlet are visible from afar. These are the scarlet passion-flowers, *Passiflora vitifolia*, which bloom only in the dry early months of the year.

It is not easy to enter these tropical woods, along whose exposed edge bushes and interlacing thorny vines form a barrier of vegetation that stubbornly resists the intruder. But here and there the cattle have forced a passageway. Pushing in through one of these narrow gaps, I find myself in a dim, subdued light that contrasts violently with the brilliant sunshine of the neighboring pasture. Here and there the vivid color

of a passion-flower catches my eye amid the tangled undergrowth.

Bright blossoms seek bright sunshine; yet the most brilliant wildflower of the valley is displayed here in the dim light near the ground. I look about me for the foliage of the woody vine that produces these superb blossoms. A few three-lobed leaves, like those of the grape, grow from the slender branches that bear the flowers. But most of these leaves are small, and there seems to be far too little leafage to support such long racemes of big blossoms. Following the rope-like ascending vines with my eyes, I catch glimpses of more of the three-lobed leaves far up among the branches of the trees. When I return to the clearing and scrutinize the roof of the woodland from the outside, it becomes clear that the main mass of the vine's foliage is spread over the upper boughs of the trees, in the sunshine. But here are none of the scarlet blossoms that seem to light the deep woodland.

Why this separation of the foliage and the flowers of the same plant? The situation is not unique among tropical vegetation, where a number of trees and vines

produce flowers and fruit low on the main trunk (a condition that the botanist calls "cauliflory") or on special, often leafless, basal branches; yet it is sufficiently rare to call for explanation. While I stand pondering this puzzle, a big, brown hummingbird darts up through the undergrowth and poises beside one of the red blossoms, into which it pushes its long, strongly curved, dark bill. As it hovers on wings vibrating too rapidly to be seen, it wags its long, slender, white-tipped tail slowly up and down. One of the larger of the Central American hummingbirds, the buff-browed hermit, *Phoebastria superciliosa*, dwells within the primary forest and the heavier secondary woodland, where it spends most of its life near the ground. Sometimes I have found its nest, a soft pocket of down and fibers attached beneath the tip of a frond of a small palm, usually of a spiny kind. The nest tapers downward to a point that matches the shape of the leaf-tip, to which it is attached by an abundance of cobweb. In this swinging cradle, sheltered from rain and from prying eyes by the broad surface of the palm frond, the two tiny white eggs are hatched by the solitary mother, and the young hummers rest until, at the age of three weeks or more, they can fly. During the breeding season the male hermits, who take no interest in family affairs, perch on twigs near the ground, tirelessly repeating a squeaky note while they wag their long tails rhythmically up and down.

As I continued day after day to watch the passion-flowers, I became convinced that, in this locality at least, the buff-browed hermits are their principal pollinator. It seems probable that the low position of the blossoms is an adaptation to secure the services of this and related hummingbirds as pollinators. The scarlet passion-flower ranges, through the humid lowlands and foothills, from Nicaragua to Peru, hence does not extend beyond the area of distribution of hummingbirds of the genus *Phoebastria*, most if not all of which prefer the undergrowth of the woodland to its upper stories. Rarely, in this vicinity, the scarlet passion-flowers are visited by a green hermit, *Phoebastria guy*, in size and form much like its buff-browed relation, but bronze-green rather than brown in plumage. But the green hermit is at home higher in the mountains, and rare here at 2500 feet, except when driven downward by long-continued, cold rainstorms.

Once a Delattre's saber-wing, *Campylopterus hemileucurus*, a hummingbird as big as the buff-browed

hermit and with a bill nearly as long but more strongly curved, took possession of a group of passion-flowers for a week or more. During this period the buff-browed hermit, who had been a regular attendant, could make only furtive visits, for if discovered it was chased away by the heavier saber-wing. But the saber-wing is not often seen in this locality.

Of the twenty kinds of hummingbirds on this farm, I saw only one other making repeated visits to the passion-flowers. This was Longuemare's hermit, *Phoebastria longuemareus*, a smaller

replica of the buff-browed hermit abundant in second-growth thickets. But with its shorter bill, less than an inch in length, this little hermit can not reach the nectar in the heart of the passion-flower. It contents itself with visiting the nectaries on the floral bracts, where it either sips the sugary secretions or picks up the small insects that are attracted by them. Its mode of visiting the flowers makes it quite certain that it does not transfer pollen from blossom to blossom. Only the three hummingbirds with bills more than an inch and a quarter in length can reach the nectar in the blossom itself and serve as pollinators.

Although it grows in the primary forest, the passion-flower is in this locality most abundant in tall, rich, second-growth woodland. Rarely, one of the vivid blossoms is displayed as high as

forty or fifty feet above the ground, but the great majority are much lower. Perhaps most are not above a man's reach, and some even lie upon the ground. They are borne, not on the main stems of the vine, but upon slender, whip-like lateral shoots, an eighth of an inch or less in diameter and up to ten feet in length. These floral branches sprawl over the ground, rocks, or surrounding low vegetation, or, if arising higher on the main stem, may hang limply in the air. Those that find some low support become the longest. They seem never to branch unless their growing tip has been injured. If in a position where they receive a fair amount of light, they bear well developed leaves of the usual trilobate form; but in the deepest shade of the under-wood the leaves are much reduced in size. At times they are tiny rudiments, which soon die.

Each of the leaves of the floral branches, if not too reduced in size, bears at the base of its furry stalk a pair, or sometimes three or four, small, reddish nectary glands, cup-shaped and opening downward. In the axil of each leaf there arise, side by side, a flower bud and a long, unbranched tendril, which is often rudi-

Blue Ridge Christmas

By ULRICH TROUBETZKOY

If Mary comes to Laurel Branch,
The elder flowers sweet and blanch
Will winter-blossom, herbs will spring,
And the hushed birds will soar and sing.

If Mary comes a visitor,
She will not find a bolted door;
Hill folk can always find her room
And weave for Jesus at the loom.

Tell Mary, Laurel Branch is wild,
A fitting place to hide the Child
From Herod's anger. Bear and deer
Would keep the secret of Him here.

Hill people keep a truckle bed
With a goose pillow for His head;
Tell Mary, we look for the Star
Above the mountains where we are.

mentary. Above these is an accessory bud that normally fails to develop, but may produce a branch of the floral shoot if the tip of the principal shoot is destroyed. The flower bud is surrounded by an involucre of three pale bracts, each broadly lanceolate in outline, and equipped with a number of nectary glands along its fringed margin. Thus, apart from the floral nectaries, the flowering shoot is provided with numerous extrafloral nectaries, whose secretions attract many ants, other insects, and the small hermit hummingbirds.

The mature flower buds begin to open during the later part of the night. I have found the sepals and petals beginning to separate at three o'clock in the morning. When, soon after five o'clock, the first glimmer of dawn brightens the eastern sky, the big blossoms are half open, or sometimes more; and the anthers have already split to release their pollen. An hour or less later they are fully expanded. Often the sepals and petals continue to turn back until they are strongly reflexed and surround the pedicel or floral stem. The five sepals and five petals are all much alike in size, shape, and intense red color; but the sepals are somewhat longer, fleshier, and broader. They are strengthened on the outer side by a keel, which the petals lack. When fully expanded the great blossom measures from five and one-half to six inches in diameter. There are rarely more than two or three open flowers on any one plant, and usually only a single one on even the longest floral shoot, for they open in succession from the base toward the tip.

The flowers stay open and are visited by the hummingbirds throughout the day. A few have perceptibly begun to close before sunset, but others are wide open when darkness falls. They close gradually during the night and are well folded up by the following dawn. Each flower opens for a single day. After closing, the perianth gradually withers but persists about the stipe of the swelling fruit. Even if pollination is prevented so that seeds are not set, the blossom folds up at the end of its single day of glory and fails to open again. But there is a constant succession of flowers until, in March, the increasing dryness puts an end to the blossoming of the passion-flowers. The last blossoms of the season may be pale pink in color and only half the normal size.

Of the complex structure of the passion-flower, it will be necessary to mention here only a few salient features of great importance in relation to its mode of pollination. The ovary is not, as in the great majority of flowers, situated between or even below the bases of the petals, but is borne at the summit of a long, slender stalk that emerges from the center of the blossom and is clearly shown in the photograph. From the summit of this exposed ovary diverge three styles, each of which terminates in an expanded stigma turned so that the surface receptive of pollen faces downward. The five stamens form a ring about the base of the ovary, and are so placed that the five big anthers, each loosely attached by its middle, hang between the stigmas, also

facing downward into the flower.

In the center of each flower, surrounding the long stalk, which holds the ovary aloft, is a triple crown of long, slender fringes or filaments. Each filament is red, or red and white; or sometimes almost wholly white. This "crown of thorns," and other less obvious resemblances of the parts of the flower to the instruments of Christ's Passion, or suffering and crucifixion, led early missionaries to America to give the name "passion-flower" to plants of this genus. Below this crown, the central stalk that supports the ovary is closely surrounded by a collar or sleeve of thick tissue, fringed at its upper edge and its lower edge turned upward like a cuff. This complex structure investing the central stalk guards the nectar richly secreted by glands at the very bottom of the tubular basal portion of the perianth. Its functions seem to be, first, to keep out insects and short-billed hummingbirds that might steal the nectar without paying for it by transferring the pollen. Second, to control the position of the preferred visitors, such as the big hermit hummingbirds. To reach the nectar these are forced by the stout collar to hold their bill nearly parallel to the central stalk. Thus no matter whether the flower face upward or sideways, the hummingbird while sucking nectar must place its head in such a position that its crown will brush against at least some of the five anthers and three stigmas that form a ring above it. The long-billed hummingbirds that I saw visiting the flowers had the tops of their dark heads richly dusted with the pale pollen. They were working for the bountiful plant even if they did not know it.

The edible fruits of passion-flowers are called "granadillas" in tropical America, "maypops" in southern United States. In most of them, the edible portion consists of the soft, gelatinous envelope that surrounds each of the numerous small, dark seeds that fill the cavity of the usually dry, tough fruit — technically a berry. The fruits of the several species vary greatly in size and edibility; some are scarcely bigger than grapes, others almost a foot in length; some have a distinctly unpleasant odor; others are sweet and aromatic. The ripe fruit of the scarlet passion-flower, of about the size of a large hen's egg and much the same shape, is prettily mottled with green and white.

Once in late April, in the tall second-growth woods where earlier in the year the scarlet blossoms had been conspicuous, I watched a squirrel feasting on one of these fruits. The furry little animal sat on a thick bush-robe lying along the ground at the base of a tree trunk. It held its thick, auburn tail above its brown back; and the fruit lay on the ground before it. It had opened one side to expose the gelatinous mass that filled the cavity. Taking a double handful between its forepaws, it ate eagerly, repeating this over and over. From time to time it bit away more of the mottled rind to expose the seeds, but this dry tissue was cast aside, only the interior mass being eaten. The seeds were swallowed along with the mucilaginous mass in which each was separately imbedded, just (Continued on page 550)

Strange Relations of Birds and Insects

By ALEC H. CHISHOLM

Photographs by the Author

IT is a mistake to suppose, because many birds subsist largely on insects, and are indeed a vital factor in keeping them in control, that the relations of the two groups end there. Some insects turn the tables by deriving sustenance from birds' bodies. Others function beneficially by serving as cleansers of birds' nests. Others are used by birds as protective agents.

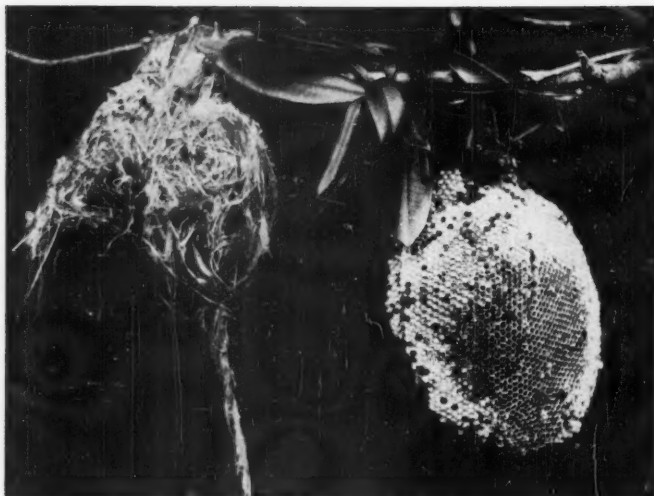
Obviously, then, the relations between the two groups as a whole are distinctly complicated. In some respects, too, they are extremely puzzling.

Most kinds of birds, including even such air-rovers as swifts, are infested by tiny parasites, some of which are peculiar to only one kind of bird. It does not appear that these unwanted guests, or even larger creatures such as ticks and leeches, do much harm to adult birds; but the mortality among nestlings through parasitic attack is considerable. In America, as a curious fact, it has been found that whereas one kind of insect — the larva of a fly — causes fatalities among only five to ten percent of the nestlings attacked, another species, closely related, causes nearly 90 percent of nestling deaths.

This fly, therefore, ranks as a serious menace to bird-life. It is, however, itself made the subject of attacks by small wasps. These lay their eggs on the fly grubs and the immature wasps eat the fly grubs in the pupal stage. A further complication is introduced by certain kinds of moths, the larvae of which crawl about the nests and attack the larvae of other insects. They eat shell and all, and apparently are indifferent whether the pupae contain fly or wasp larvae.

It is interesting to observe how the biological chain is linked — the grubs of the flies live on young birds; the grubs of the wasps live on the grubs of the flies; the grubs of the moths live on the grubs of the wasps; and finally, no doubt, the moths are snapped up by adult birds and fed to the nestlings. Thus the whirligig of life brings in its revenges!

No less remarkable are the habits of certain insects



Nest of the fairy warbler of Australia beside the nest of a colony of wasps. Such association is frequent among Australian warblers, and poses interesting questions.

that frequent birds' nests for benevolent purposes. Such insects do not attack the nestlings but subsist on refuse in the nest. They are, in fact, natural cleansers.

An example in point was discovered by William McLennan, a zoological collector, in the wilds of north Queensland during 1922. Examining nests of the golden-shouldered parrot, a beautiful tropical bird that burrows into the mounds of termites for nesting purposes, he found many caterpillars on the floor of each egg-chamber. These insects were then unknown. It was learned later that they spend their lives in the darkness of the parrots' nests, feeding on the droppings of the young birds and even cleaning their feet and feathers. Pupation takes place in the chamber and a small moth emerges to complete the cycle. This singular species has been named *Neossiosynoeca scatophaga*, which means, in effect, "new social scavenger."

The association, it will be seen, is three-sided — the parrots depend upon the termites for nesting-sites, and the caterpillars depend upon the parrots for sustenance. What compensation the termites receive for acting as hosts, if they receive any at all, is not clear. Anyway, the birds do not appear to harm them, and certainly they do not harm the birds.

Examples of insects acting as nest-cleansers have been reported also from South America — involving a parrot, and Central Africa — a hornbill.

In Africa it was found that the female of one of the large hornbills remained shut in her nest, in a hollow tree, for as long as fifteen weeks, during which time the male fed her, through a narrow entrance-slit, with as many as 24,000 fruits. By ejecting debris through the slit the brooding bird maintained the sanitation of the nest to some extent, but subsequent examination showed that much of this essential work was done by

The white-throated warbler and its symmetrical nest. This bird sometimes chooses a nest site in an ant-infested tree.

insects. No fewer than 438 insects, mostly larvae, were obtained in that one nest. They represented eight species, two of which were new to science. The interior of the nest was astonishingly inoffensive. It was, in fact, practically odorless.

That imprisoned bird appears to have established a mutual benefit society with her hundreds of insect associates. Certainly they rendered her stout service, but she, in turn, provided them with comfortable "board and lodging." Accordingly, when the hornbills failed to establish themselves in the same spot a year later, the insect visitors to the hole were much fewer in numbers. Also, they were entirely different in composition.

Yet another remarkable practice relating to the presence of insects in birds' nests is one that is followed by a distinctive dweller in the drier parts of Australia, the crested bell-bird. Chief characteristics of this sprightly, thrush-like bird are the utterance of a rippling, mellow, highly-melodious solo, which has ventriloquial qualities, and the singular habit of placing live grass-caterpillars among the eggs in its cupshaped nest of bark.

Why do not the caterpillars crawl away from the nests? We asked ourselves that question many times before finding an answer. We noted that many of the insects, although able to wriggle somewhat, appeared sluggish, almost "dopey," and we wondered why they stayed put long enough to get into that condition.

The facts are that, because of the nature of their habitat, the bell-birds have to provide, not for a rainy day but for a dry day. They know that caterpillars are apt to retreat into the soil when parching sets in, and so they grab as many as possible and stow them amongst the eggs. In short, they keep "stores." As for their method of causing their captives to remain alive yet powerless to escape, they are not able to use anaesthetizing stings, as do wasps, but they have an effective



substitute — they press each victim, gently but firmly, along the backs with their beaks, so bringing about a kind of paralysis. Thus it is that, no matter how unfavorable the period of their birth may be, young crested bell-birds are always, assured, right from the beginning, of food supplies kept by their provident parents.

This practice on the part of the crested bell-bird appears to be without parallel. But there is another example of bird-insect association, and a curious one, that wins international favor. In this instance, or series of instances, the association is not inside but outside the nest, and the object of the practice is not sustenance but protection. Occurring mainly in tropical areas, the practice is one that certain birds have of building their nests close to the nests of wasps or other aggressive insects.

Australian adventurers in this manner are tiny warblers of the genus *Gerygone*. First reported of the pretty black-throated warbler, the practice has since been observed also in the cases of the large-billed, buff-breasted, and fairy warblers. In each instance the development resolves into a singular example of social symbiosis.

Warblers' nests in general are symmetrical,



Inspecting a parrots' nesting-hole in a termite mound. In the chambers within insects live as cleansers of baby birds.

Nest and eggs of Australia's crested bell-bird, which stores grass-caterpillars among the eggs so that the young birds will be assured of food.

long-tailed, and equipped with a "porch" over the tiny side-entrance; they are suspended from thin horizontal branches, usually within arm's reach but sometimes at higher places. Most members of the group (six of the eleven Australian species) customarily build over or near water. One or two others suspend their nests from vines in rain-forests. Undoubtedly, however, the most striking practice of a protective nature, as favored by the four kinds mentioned above, is the placing of the nests near colonies of wasps of various kinds. So confirmed is this habit with the black-throated warbler that it has become known to bushmen of its region as the "hornet-nest bird."

The occurrence is too frequent to be capricious. Anyone who supposes the association to be casual, and therefore purposeless, should attempt to disturb one of the birds' nests. His view will soon be readjusted under the impetus of scores of fighting wasps. And if he yearns to photograph the queer combination, he would be indiscreet to go into action before smoking out the wasps.

Believing the association to be one-sided, we have sometimes wondered why the wasps — which attack human intruders on the slightest provocation — tolerate the presence of the flitting birds. A partial explanation, perhaps, lies in the fact that all birds that build in such situations have domed nests, and therefore are screened when brooding. But what of the period when the nests are being built? The birds are wholly exposed to them, and their fuss and flurry can scarcely escape the attention of the alert insects.

At any rate, it appears that there is a limit to the wasps' tolerance of their feathered neighbors, for Bates, in his *Naturalist in Nicaragua*, tells of a bird that broke the peace being stung to death. Flying out of the nest hurriedly, it became impaled on one of the thorns in the nesting-bush, and its wild struggles to break free aroused the wasps, which flew down upon it in hundreds and in less than a minute stung it to death. The watching men tried to rescue the bird, but the wasps attacked them also and one member of the party was severely stung.

Bates adds that other travelers have noted the fact of certain birds building their nests near colonies of wasps, and he mentions as a further example a species in Jamaica and another in Brazil. "I should have thought," he says, "that when building their nests they are very liable to be attacked by the wasps. The nests placed in these situations appear always to be domed, probably for security against their unstable friends."

Why, it may be asked, should the birds desire such "friends"? What enemies have they, in places un-



frequented by man, against which the wasps might afford safeguards? And, for another thing, is there any evidence that they really benefit by the association?

Much more knowledge is needed before these questions can be answered with any degree of confidence. At a venture, one would say that the birds that nest among thorns are not likely to be molested by either mammals or reptiles, and so it would seem that the only advantage to be gained is protection from larger birds. Even in that regard, however, the efficacy of the wasps is uncertain.

The general problem has been studied to a considerable extent in recent years by some few observers in Africa, and in particular by Mr. R. E. Moreau, of Tanganyika, one of the keenest bird-biologists in the world.

Records assembled by Mr. Moreau reveal that in Central Africa certain birds have been known to associate for nesting purposes with insects, spiders, other species of birds, and human beings. The observations relating to the last two associations tally with those made in various countries, but the subject as a whole is carried a good deal further by notes on birds using spiders' nests as nesting-sites, and by many observations of birds nesting in association with wasps, ants, and bees, respectively.

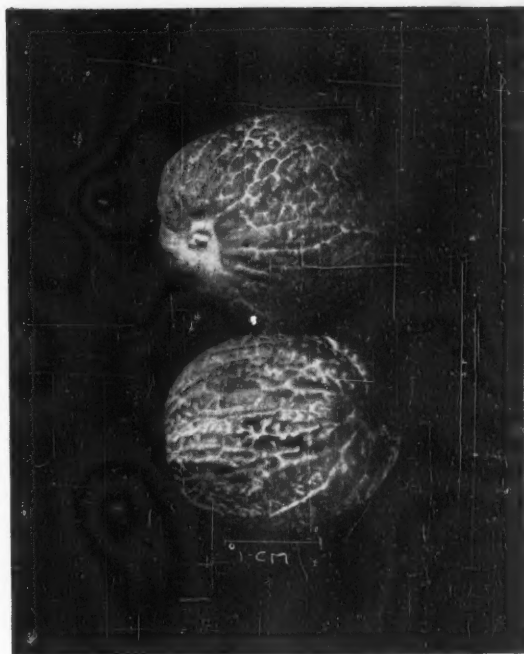
Relatively few of the African examples of bird-insect association relate to ants or bees. Most of the birds concerned — weavers and sun-birds in particular — are "wasp-minded," and the number known to manifest this taste in nesting-time, more or less consistently, is really remarkable. In all instances, it would seem, the insects' nests are built first, and in all instances the birds could have found other suitable sites, away from wasps, without difficulty.

"It is impossible to avoid the conclusion," says Mr. Moreau, "that by these associations the birds seeking them obtain some degree (Continued on page 550)

Nutmeg and mace are peculiar among spices in that they are both derived from the same part of a plant. These spices are native to the Moluccas, and, like clove, were long controlled by the Dutch, until trees were successfully cultivated elsewhere. The fruit of the nutmeg tree matures in a husk somewhat similar to that of the English walnut. When the husk is removed a red, membranous skin is revealed. Removed and dried, this becomes mace. Within this skin is the nutmeg. The flavor of these two spices is similar.

The nutmeg tree grows to a height of thirty to forty feet, starts to bear fruit at five or six years and reaches full maturity in fifteen years. Flowers of the tree do not bear both male and female organs, and, therefore, are incapable of self-pollination. In a plantation one male tree to ten female trees is a suitable balance. If the male trees are found to be too numerous, shoots of the female trees are grafted on them and the sex is thus altered.

Nutmegs were one of the spices used in ancient times for fumigation of odorless streets. In earlier days the production was strictly regulated to prevent an overabundance of either spice, and trees were ordered cut down when unbalanced production was discovered.



The Spices of Life

Photographs by William D. Barkley

ALMOST every day one or another of the spices has had a part in what we have eaten, most of them without our realizing which spice. Yet we would miss them if they were not present.

Linked though they are with ordinary living, spices have a long and romantic history, conjure up pictures of far lands and the spice trade of centuries past. Indeed, spices have had much to do with the rise and fall of empires, and the making of great fortunes. They are associated with adventure, camel caravans of the desert and clipper ships of the seas. One of the factors contributing to the backing of the voyage of Christopher Columbus was the hope of finding new sources of pepper, one of the most important and ancient of spices. Colonial empires have been built upon these plant products, and for a long time some of the spices were national monopolies.

In an earlier day, when disease was believed to be spread by odors, spices were in great demand to counteract such odors, thus to act as supposed disinfectants. They were also credited with curative properties. Where today we know that cleanliness achieved by liberal use of soap and water is basically important, not too long ago perfumes, fragrant oils and spices served to mask the lack of cleanliness.

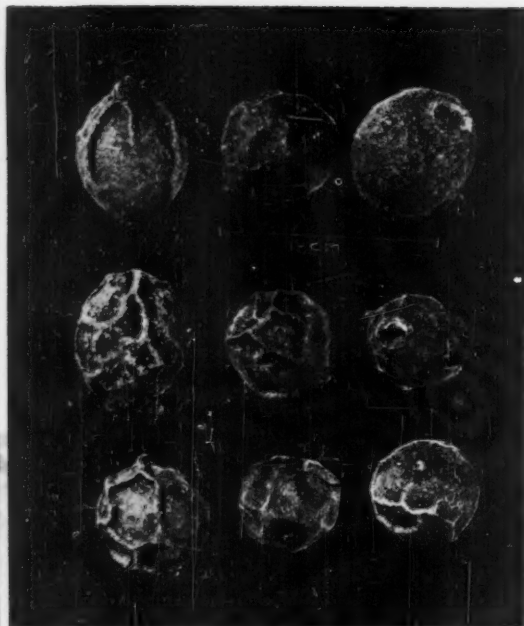
Today, however, the chief use of spices is as flavoring, and their principal place is in the kitchen. Quantities, however, are used in the compounding of medicines, although primarily for their odor or taste rather than any medicinal values that they might be supposed to possess.

Spices come from various parts of plants. Some come from the fruit, or seed. Others, like ginger or turmeric, are from the root or rhizome of a plant. The leaves of other plants, such as basil, mint, parsley and others, provide other spices, while cloves are the dried, immature buds of an evergreen tree belonging to the Myrtle family.

In these pages we are confining ourselves to the fruits of plants that give us a number of spices with interesting names and histories. Quite a number of these come from the Parsley family, perhaps the leading contributor to the spice list. Some of these aromatic fruits come from vines, as pepper, or from trees, as with nutmeg and mace.

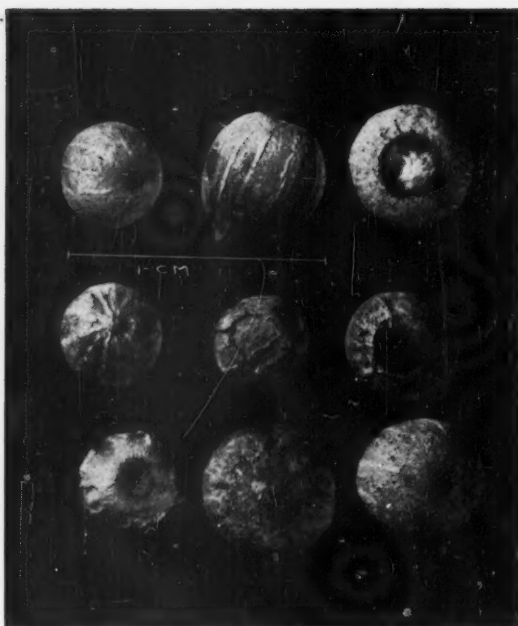
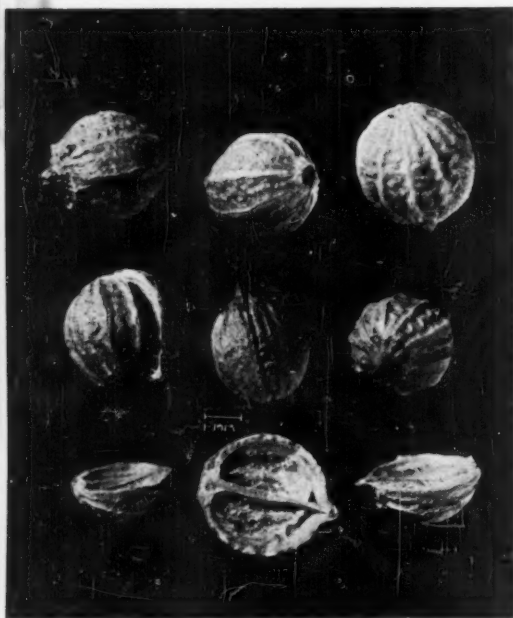
The seeds themselves are interesting, although a low power microscope or a good magnifying glass are necessary to full appreciation of these odorful fruits. Here the seeds have been carefully photographed and enlarged in such a way as to perform at least a part of the service rendered by other mediums of magnification. The pictures on these pages will serve as identification for anyone investigating these seeds further. The photographer has supplied with each picture a scale; which shows the relative size of the seed in either millimeters or centimeters.

This pictorial introduction to the spices has particular relation to school work, since they relate so much to history, geography and world economy. In his Educational Insert No. 61, Dr. E. Laurence Palmer gave us a special feature entitled "Some Flavors and Scents." This leaflet, available at twenty cents a copy, affords opportunity for further study of this fascinating subject.



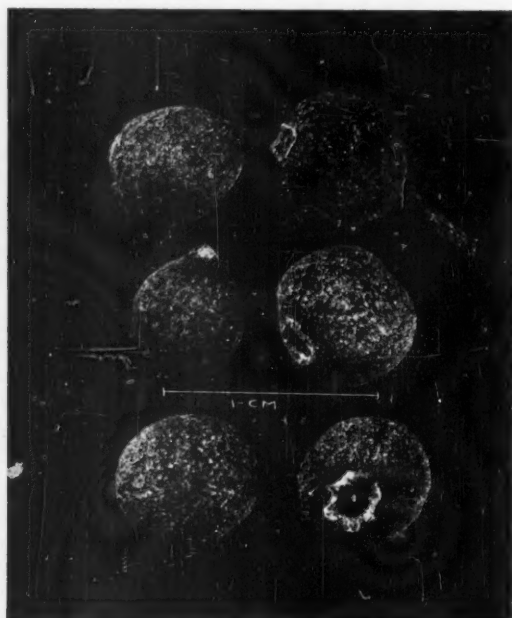
Pepper is one of the world's most popular and important spices, has affected the history of nations and has even served in the capacity of money. Soldiers were compensated in pepper and indemnities paid in this spice. Many fortunes can be traced to its production, transportation and sale. Destruction of pepper vines in Indonesia during the Japanese occupation resulted in dislocation of the world supply.

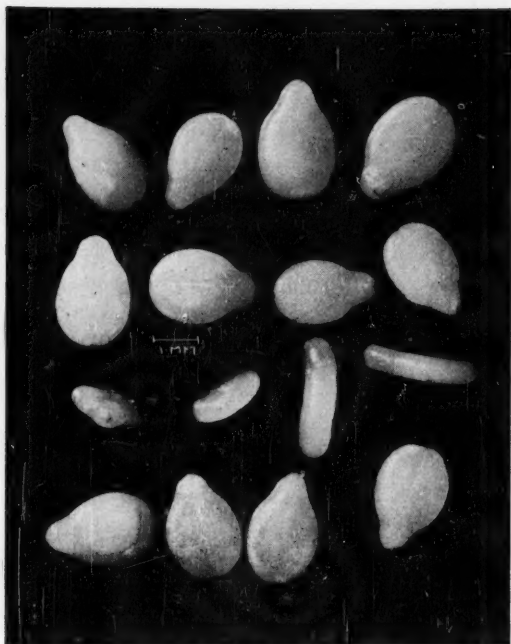
Coriander is one of the oldest known spices, in use some 5000 years before Christ. It is the fruit of an herb of the Parsley family, native to Europe and now grown in South America. It was used in love potions and supposedly possessed aphrodisiac powers. It was used by the Carmelite monks in the making of the Water of Carmes, which, taken internally, was a cordial, externally a toilet water.



There are two forms of pepper, black (left) and white (above). To produce black pepper the berries are picked from the vines before fully ripened, then sun-dried to a deep rusty-brown. For white pepper the berries are allowed to ripen on the vine. After harvesting and drying, the dark outer husk is removed. The resulting fruit is light tan in color and the surface of the pepper kernel is more or less smooth.

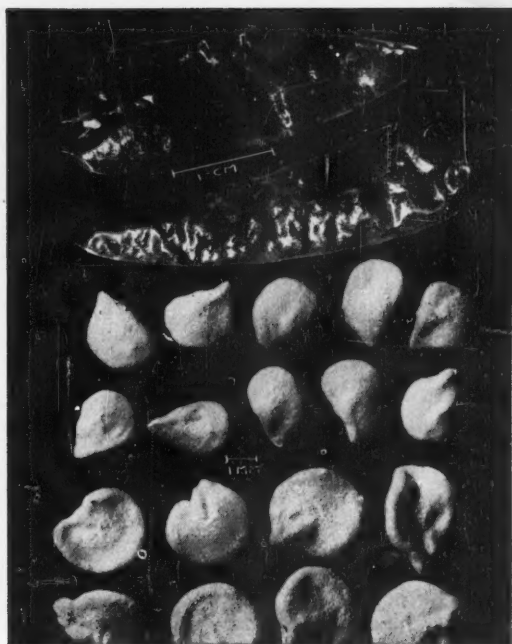
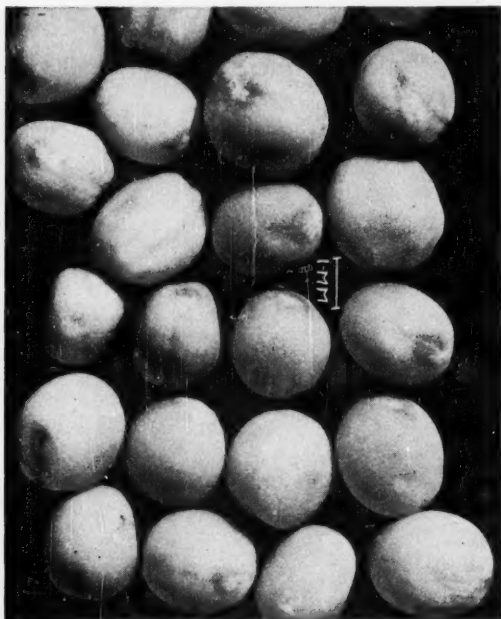
Allspice is the fruit of an evergreen tree of the Myrtle family, practically the only major spice native to and grown exclusively in the Western Hemisphere, mainly in Jamaica. The berries, picked when mature but not fully ripened, are sun-dried to a deep reddish-brown. It is not a mixture of spices, as the name suggests, but is so named because its flavor suggests a mixture of cinnamon, nutmeg and clove.





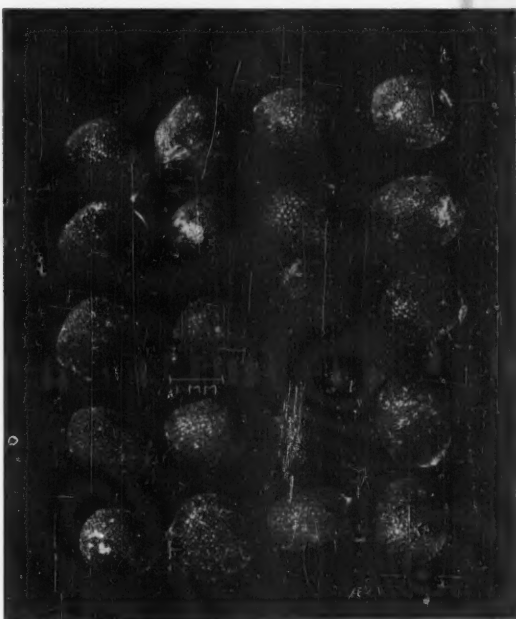
Sesame seed is the fruit, or seed, of a plant that is a member of the *Sesamum* family. It is native to Asia and grown in India, Turkey and China. It has a nutty taste and a faint nutty odor. It is used in the bakery trade and much goes into making Halvah, a Jewish candy. Sesame seed also contains a fixed oil of commercial value. The hulled seed, above, are smooth and shiny and feel slippery.

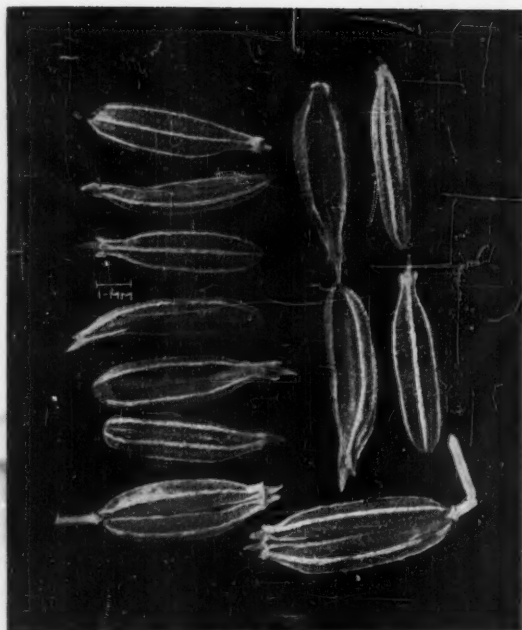
Mustard is one of the ancient spices, probably ranking second to pepper in usage. It is native to Europe and Asia but is now widely grown. There are numerous Biblical references to it. The Romans are supposed to have introduced it into Great Britain, where the seeds were soaked in a grape juice, or "must," giving it the name of "must-seed," corrupted into mustard. Wild mustard is common in the United States.



The genus *Capsicum* gives us cayenne pepper, chilli powder, red pepper and paprika, depending on the way the dried, ripe fruits are treated. The various species of this genus are natives of tropical America, but will thrive in any hot climate and are now widely cultivated throughout these areas. The degree of "hotness" depends upon the parts of the pod used in producing these spices.

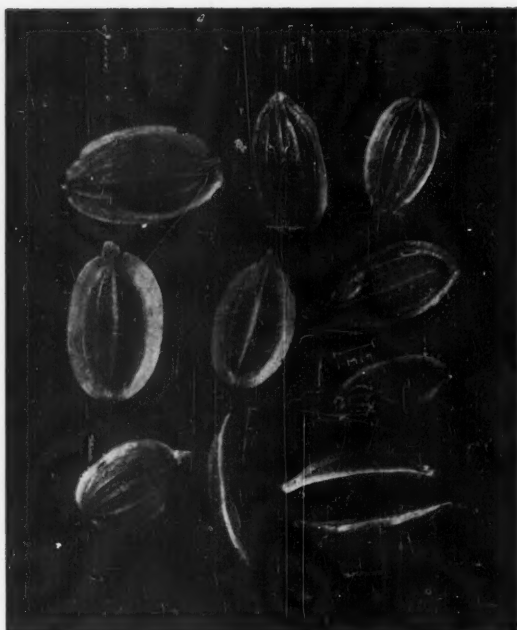
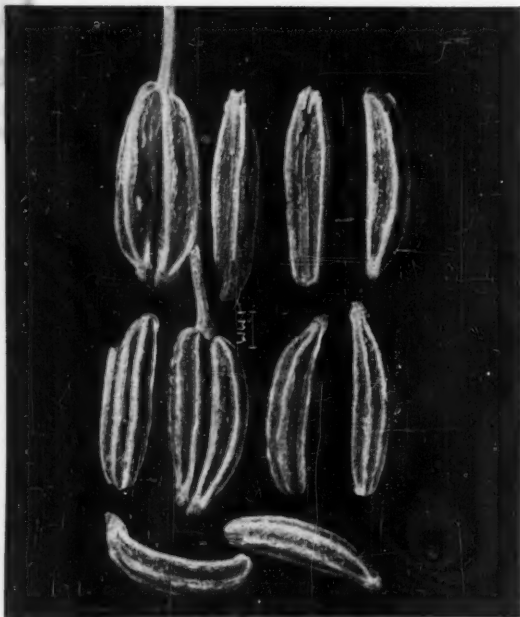
Below, left, is yellow (or white) mustard, and, right, black mustard, commonly called brown mustard. Turmeric is a common coloring agent used to give mustard its familiar yellow color. The seeds come from a plant of the genus *Brassica* and are therefore related to cabbage, kale, cauliflower and others. Black mustard contains a volatile oil, and white mustard contains a fixed oil.





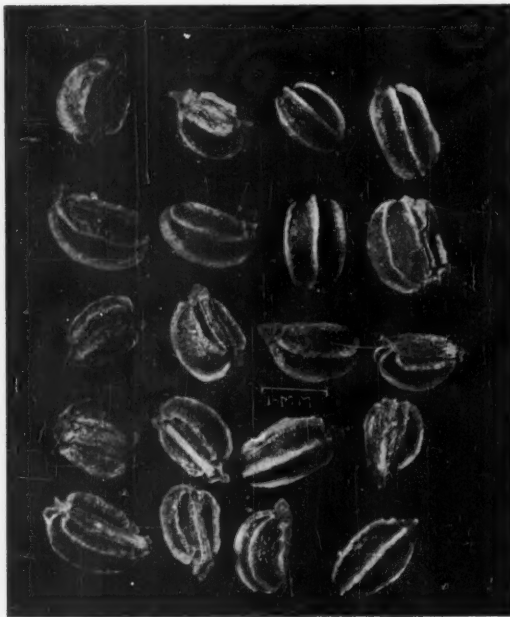
Cumin is the fruit of one of the members of the numerous Parsley family, and is native to Egypt and the Mediterranean region. It is an ancient spice, referred to in *The Bible*. Its odor is strong and distinctive and resembles caraway. It is used in cooking and in connection with prepared meats. Theophrastus said that in order to insure a good crop one should curse and abuse the seed when sowing it.

Caraway, another fruit from a member of the Parsley family, is a European native now widely cultivated. It is perhaps best known for its association with rye bread. It has long been used in the production of kummel, a Dutch cordial, and is also a flavoring for pork sausage. Its flavor is most distinctive, agreeable and aromatic. The seeds are light to dark brown and have pale, somewhat yellowish ridges.



Dill is the fruit of another member of the Parsley family and a native of Europe. It is now grown widely there and in England, India and the United States. In the public mind it is most widely associated with the dill pickle, but it is also used widely in flavoring soups, sauces, meat dishes, and the ground seed is used in various kinds of sausage. In times of war it has been used in place of caraway seed.

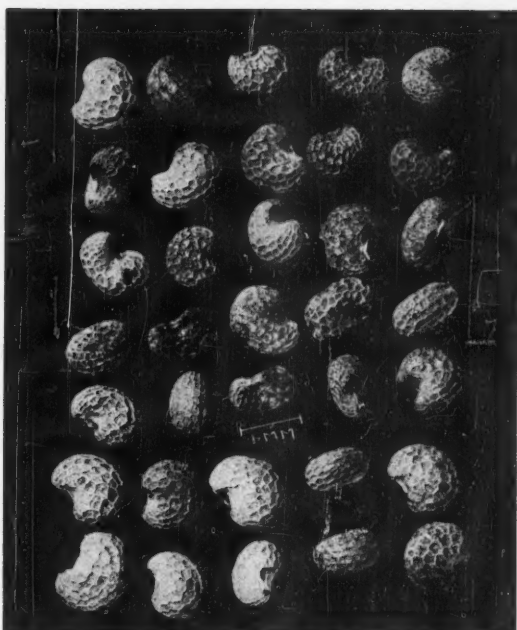
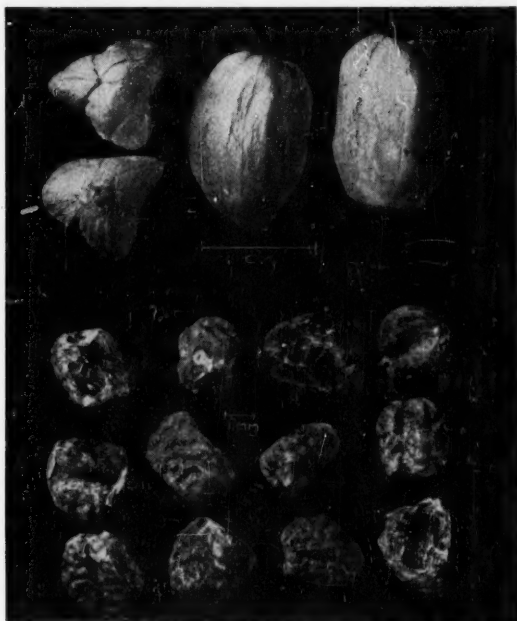
Celery seed, another Parsley relative, does not come from the celery plant that we know as a vegetable. It is a native of southern Europe but is now cultivated widely in Europe, India and the United States. It closely resembles in flavor our vegetable celery, and enjoys popularity in the kitchen as a substitute for it. It is used to make celery salt, being ground and mixed with ordinary table salt.





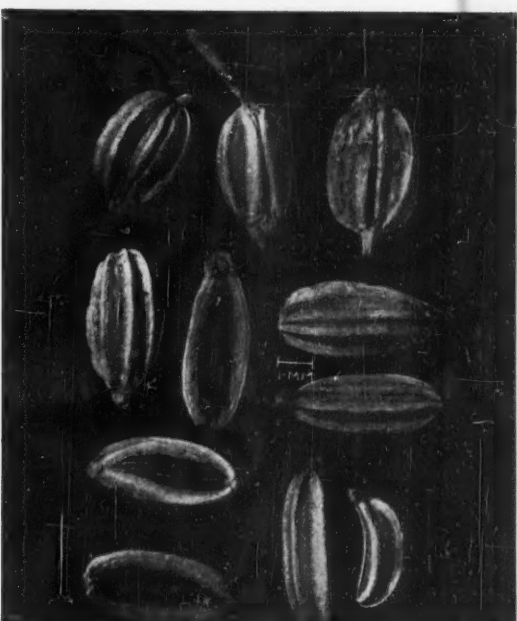
Anise is another member of the Parsley clan. It is native to Egypt, but is now widely cultivated in temperate, warm and hot climates. We know it best, perhaps, as a flavoring for licorice, and as the flavoring for anisette and other liqueurs. Bakers also use it extensively for flavoring rolls, cakes and such. Anise is an ancient spice, mentioned in *The Bible*, and Romans used a sprig of the plant to ward off bad dreams.

Cardamon seeds, shown bleached above and in a capsule below, come from an herb of the Ginger family. The plant is native to India and Ceylon, but is now grown in Central America. It is used as a flavoring in baking and is an ingredient of curry powder and mixed pickling spice. It is not as popular in the United States as other spices. The unopened fruits have an aromatic odor, and the capsule a slight aromatic taste.



Poppy seed is an Asiatic native now widely grown. In color it is slate-colored, although known as "blue poppy." Sometimes some inferior seeds are dyed blue. The seeds have no narcotic properties, so eating rolls covered with poppy seeds is not habit-forming. There is a fixed oil in the poppy seed that has considerable commercial importance. Under a low-power microscope the seeds are interesting, as are most spices.

Fennel comes from another member of the Parsley family and is a native of Europe. It is now widely grown there and also in the Orient, including Japan. In odor and taste it resembles anise. It is used by bakers, and Italians particularly favor it when roasting pork. It also is used in the manufacture of sweet pickles. The seeds are greenish or yellowish-brown and many of them have a short stem attached, as shown below.



The nests of barn swallows are semi-circular structures of mud mixed with sand. They are usually lined with hay and feathers. While in Nature the barn swallow nested in holes in cliffs or crevices, it has readily adapted itself to human habitation. Nests may be fastened to rafters in a barn, or under an old bridge. Covered bridges were once favored spots. The barn swallow nest usually contains three to five eggs that are tinted with lavender and spotted brown. Usually two broods are raised each season. Here is a typical nest with young birds impatiently waiting to be fed. On the next two pages are more pictures depicting incidents in the lives of these swallows.



Air Policeman — The Barn Swallow

By GLADYS EMERSON

Photographs by the Author

OF THE more than thirty species of American swallows, the barn swallow is the best known among those who live on the farm lands and prairies of the mid-West. These little birds are of great value to the farmer. They fly by day and feed on the wing, never flying in a straight line, but circling and darting in the air, destroying an unbelievable number of noxious insects including, mosquitoes, house flies, gnats and horse-flies around the farmyards. Flying over the fields they destroy ants, grasshoppers, leaf hoppers, locusts, and other insects. They are seemingly tireless, and farmers enjoy seeing them in late evening darting and skimming over the fields of waving grain in pursuit of winged morsels for the hungry mouths awaiting in a nest on a barn rafter. As the

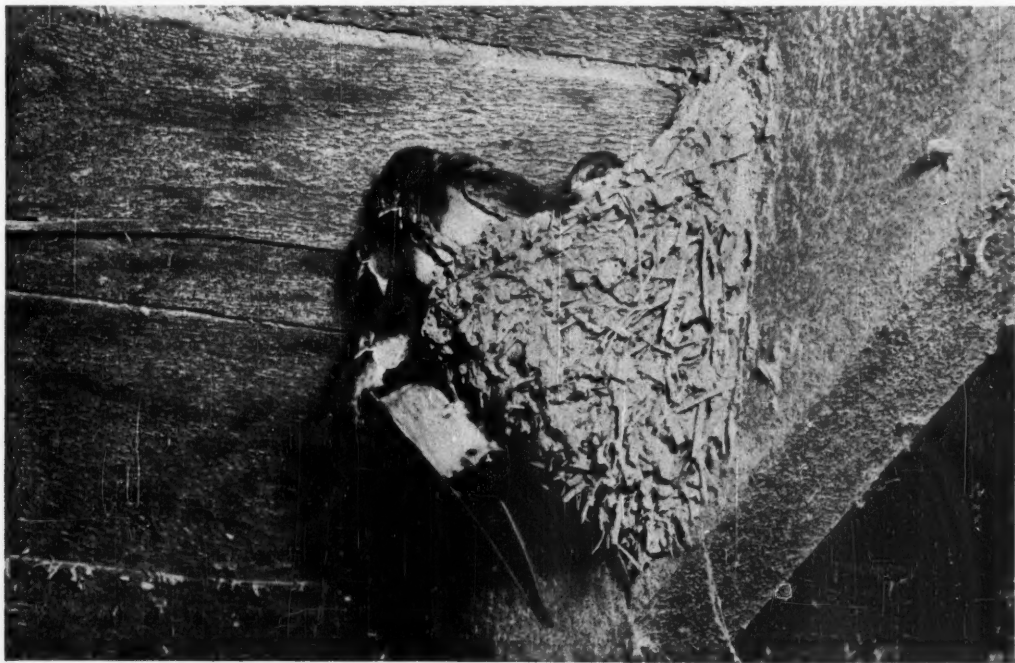
sun sinks, these friendly little fellows come in from the fields and flit around the barnyard and lawn, still eating.

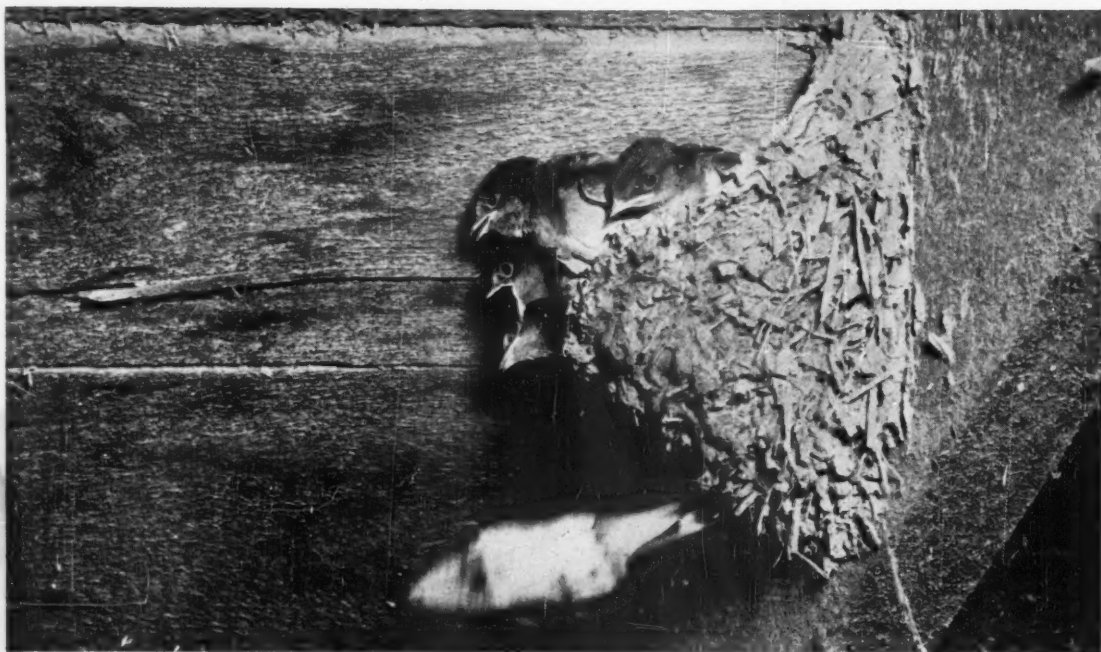
The barn swallow is a small, trim bird, easily recognized because of its purplish-blue upper parts, its cinnamon colored under parts touched with white, and its elongated outer tail feathers, which form a deeply forked tail.

In the late summer the barn swallows band together in huge flocks. In the evening they form long lines on telephone wires. About the first of September they begin their long journey to South America. They do all of their migratory flying by day, feeding as they fly. At night they settle down in a convenient swamp or group of trees to rest. The barn swallows, when they reach the Gulf of Mexico, probably make the crossing in one day.

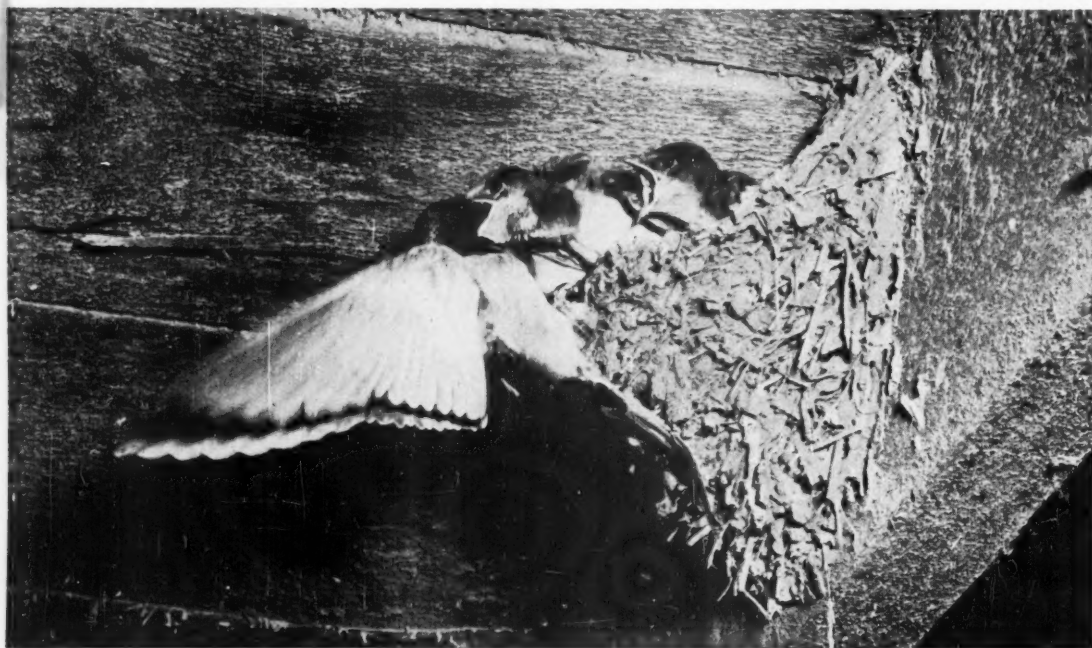


Above, left, the camera caught the parent bird feeding one of its brood while two others give voice to their hunger with open mouths. The bird nearest the camera apparently had been fed and sat quietly in the nest. To get such pictures the photographer must be alert and the camera have a fast shutter. The picture at the right, above, was snapped a second or so after the first, and shows the parent still perched on the nest after having deposited the insect luncheon in the young bird's throat. Below, the parent is feeding the same youngster while the other two still protest. The pictures were made with the camera about four feet from the nest. It took a day for the birds to become accustomed to the prying human intruder, and after the first shot they seemed to take the flash as a matter of course, except the one youngster nearest the camera.





In the photograph above the parent apparently became frightened and by-passed the nest. This picture shows the speed of the bird, since the same camera speed was used as in the previous pictures. While the youngsters leave the nest and flock on wires, the parent merely sweeps down and drops the food into the waiting mouths without stopping. When the young are able to fly they are fed in full flight, and in this way soon learn to catch flying insects, although this instinct, of course, is inherent. In the picture below the demands of the second youngster seem at last to have had effect and he is getting his lunch. But the third bird is not visible, and the first one is still hungry. This photograph effectively shows the graceful wingspread of the mother bird as she clings to the nest to provide food for her babies.



The Spirit of Giving



RECENTLY the eminent investment banking firm of Merrill Lynch, Pierce, Fenner and Beane brought out a little folder that it entitles "In Part Payment." The payment of which this is a part is "of a debt we can never fully repay — for the priceless contributions of our educational and benevolent organizations."

This folder relates to the serious situation that faces most educational, scientific, religious, charitable and cultural organizations because of the economic developments of the past few years. In some countries the functions of such organizations have been forcibly taken over by the government; in others the organizations have turned to the government for subsidy and thus ceded most of their autonomy.

In the United States the free operation of such institutions and organizations has gone hand in hand with our own concepts of personal freedom. Thus support has come from the public. And this year Congress recognized this source of support, and the desirability of maintaining it, by increasing from fifteen to twenty percent the amount of contributions deductible for income tax purposes.

Under the law an individual may make a tax-free donation to any domestic non-profit "corporation, trust, or community chest, fund or foundation...organized and operated exclusively for religious, charitable, scientific, literary, or educational purposes, or for the prevention of cruelty to children or animals." Organizations and institutions that can demonstrate to the satisfaction of the Treasury Department that they fall properly under this provision are recognized as such, and contributions to them may be deducted for income tax purposes.

During the past ten years all such agencies have been confronted by the doubling and trebling of costs. Everything from printing to paper clips has gone up, while the value of the dollar has decreased. The buying power of income from endowments and donations has gone down, while the book value of investments for endowments, being largely in bonds and "safe" securities, has increased little, if any. Some institutions have been forced to draw upon the principal of the endowments, and, for example, half the private colleges in the country are operating at a deficit.

Salaries of employees of such institutions and organizations have always been low and have not kept pace with rising living costs. Social security benefits have been extended to include such employees, with

coincident cost to the agency and to the individual.

The result of such financial and economic pressure has been forced economy, often at the expense both of staff and services rendered. Thus the benefits to the people and the country generally are of necessity curtailed. This, in turn, strikes at the very base of our American philosophy of public support for organizations and agencies of good will, sound objective and constructive goals.

There is no greater guarantee of the future prosperity of our country, and the maintenance of its position of leadership in a free world, than appreciation of the vital importance of our natural resources and their wise use today, and tomorrow. And educational and scientific organizations in this conservation field are no exception among the institutions adversely affected by the current situation.

Nor is the American Nature Association any exception, with its endowment, augmented by gifts for specific projects of national or international conservation significance, the Association has been able thus far to carry on its work with relatively little curtailment. However, *Nature Magazine*, its voice, is produced at an annual loss that must be met from endowment. Physical improvements in the magazine are impossible with current prices what they are, for everything that goes into the making of the magazine costs more, and more. New projects have to be shelved for the time being and current work carried on at the most economical level possible.

Everyone, as the folder mentioned here points out, feels the impact of higher taxes. At the same time, never before has it cost so little to give so much, especially for those with higher incomes. Merrill Lynch, Pierce, Fenner and Beane have compiled some interesting tables to show how this works out with respect to individual incomes, as well as gifts from corporations. And there are other legitimate provisions of the tax laws relating to capital gains and losses that make giving easier.

If, then, we are to continue our traditional policy of public support of those institutions and organizations recognized as of basic value in a free nation, more attention must be focussed on wider and more substantial giving to them. Perhaps it is not inappropriate at this time of year, when the fiscal year is about to come to a close and the spirit of giving is exemplified by the Christmas season, to call attention thus frankly to the plight that faces many agencies working in the interests of peace on earth and good will toward all men.

Christmas Vandalism in Our Forests

By CHARLES E. BOOTH

Illustrations by Russell O. Berg



It was the week before Christmas.

WITH THE spirit of Christmas ascendant throughout America once again, it seems appropriate to consider the effects of some phases of this "spirit" on conservation in our rural areas.

Christmas is the time of year to express kindly feelings toward fellow men, and to exchange greetings among friends. In forests all over the country, however, the Yuletide season too often leads to disaster. Evergreen groves suffer tremendously in all of the States because of thoughtless persons seeking decorations for the holidays. Ground pine, Prince's pine, laurel, holly and other such greens are often torn up by the roots, their best parts removed, and the remainder of the plants left to die. Small evergreen shrubs and trees suffer the same fate. In fact, certain species of evergreens are all but extirpated locally by enthusiastic persons who give little or no thought to the damage they are inflicting.

In my experiences as a special patrolman in a privately owned forest, I have witnessed such destruction many times. I remember one case in which a group had just finished "Christmas shopping" in a small grove in which there were many young spruce and hemlock trees. While checking their car, I noticed several small hemlock branches protruding from the trunk. Closer investigation proved that some choice branches had been cut from a good-sized tree. But worse was the fact that *the tree itself* had been hacked down and discarded, its trunk literally chopped to pieces about two feet from the ground. Such devastation is not only criminal; it is also costly and unnecessary. It would take many years to grow another such tree.

Someone else wanted some cones from white pines. As most of the cones grew at the tops of the trees, out of reach, a long pole, or similar tool, had been used to catch hold of the branches and bend them into easier reach. Most of the branches had snapped under this sort of treatment and were found hanging loosely from

the trees. The pine cones were obtained, but only after scarring the trees.

Cases such as these are not at all uncommon in the forests during the Christmas season. As in most woodlands, our forest was invaded about two or three weeks before the holiday, and the vandalism took place right up until two or three days before Christmas. While we were able to check the majority of trespassers, a few managed to slip by and commit their destruction. There are always certain individuals who, despite posted areas, will pay no attention to signs. A caretaker or patrolman has to make allowances for them. But there are others who are well-known, respectable persons who seem to forget themselves and their reputations when the Christmas season rolls around. These are the people who make life difficult for the forest protectors.

One Christmas season, two men were seen entering a protected area in the forest. This particular section was set aside for the growing of new hemlocks, part of a reforestation program. Before we were notified of their presence, they had cut nearly seventy-five small trees, which they boldly told us they wanted for a store window display. Each tree was hardly more than a foot in height. There was absolutely no excuse for their actions as they were perfectly aware of the value of those trees to the forest. In this instance, the forest suffered a severe loss.

Two women contemptuously ripped a large sign at the entrance of the forest, tore it up and claimed that they had not seen it. The sign had been placed there to close the forest to the public for the winter season. Fortunately, a man who lived near the forest appeared against the women and they finally admitted to destroying the sign, "so we could look for evergreens."

Most of the evergreens taken from the forests are torn from trees and shrubs. In most instances, no effort whatever is made to make a clean cut on the

branches. There is no thought of the future of the trees. Some of the torn spots will heal in time, but they are usually an open invitation to insect larvae and to fungus diseases. Even if the trees do live, the chances are they will be permanently disfigured. It is not only disgusting to note the many people who abuse our forest trees in this manner, but it is also alarming. If only these persons would stop to think of the disgrace they bring upon themselves when they joyfully ruin a patch of shrubbery, or deface a valuable tree, perhaps we would be able eventually to see an end to this ugly practice.

There are many farmers who own woodlands and are kind enough to grant permission to pick ground pine and other vines to responsible persons, who they know will not abuse the privilege. But if word of their presence in the forests reaches the ears of the general public, the chances are that the owners will be obliged to close the areas. It seems to be a great temptation to the average person to take advantage of a favor of this type. Starting with the innocent picking of a few ground greens, the removal of a few choice branches from an evergreen tree usually follows. And if they are detected, the trees themselves may be destroyed.

In checking a group of high school boys a few days before Christmas one year, I noticed that they had four burlap bags on the ground beside them. The bags were supposed to be full of different kinds of cones. A close look at them, however, revealed the fact that they held more than just plain "pine cones." They contained a large assortment of all kinds of evergreens; many of them tiny trees with their roots still intact. The cones simply covered the tops of the bags.

On another occasion, four young boys and a man were checked as they gathered greens near a swamp in a remote part of the forest. When we approached them, they appeared very much surprised at our attitude. The man showed us the slips of spruce and hemlock boughs that had been neatly severed with a sharp knife. He seemed indignant that we should accuse him of harming the trees in any manner. "After all," he said, "we only took about a dozen tiny branches and we cut them so as to leave no scars."

He had forgotten two important factors. In the first place, he and the boys had no business trespassing on posted property. Secondly, it had been the task of the boys to climb the trees and secure the best branches, the ones near the top. In climbing the trees, they had broken a great many small branches on the



They took more than pine cones.

way up. It had not occurred to the boys or the man that their method of cutting branches had been more costly than if they had just taken the lower branches.

The story of Christmas vandalism in the forests does not end with the mere picking of forbidden evergreens, or the tearing down of an occasional sign. The wholesale destruction of fences, the setting of forest fires and the out-of-season hunting on posted property must be included. Practically the same pattern of vandalism is followed in wooded sections across the nation. The blame cannot be placed upon children alone. The greater part of it is performed by adults, willful trespassers who have no regard for either the written law or for the importance of conservation. A small percentage of vandalism might possibly be charged to carelessness. But in the majority of cases there are no excuses. To destroy the life of a tree or a shrub in the forest on posted property at Christmas time is to display sheer ignorance of the true meaning of this greatest of all holidays.

In spite of the damage done in our forests from coast to coast at this time of the year, it is a comfort to know that Christmas vandalism in the forests is caused by a small minority of the people. Education toward a better understanding of conservation in all its forms is being undertaken by such worthy organizations as the 4-H clubs, the Boy Scouts of America, the Girl Scouts of America, the Campfire Girls and others.

The next generation should be better equipped to aid and preserve our forest areas, and should be made to respect the rights of owners of private property.

Lone Gull in Storm

High o'er the restless, white-capped lake,
A lone gull breasts the darkening skies,
Wide-sweeping, defying the lowering wake
Of thundering cloud-burst symphonies.

By GAYLORD DAVIDSON

Fearless of storm, triumphant in flight,
This wild bird wheels in majesty,
Piercing the sullen, cloud-made night,
Exulting on its fearless way.



Lash-horn trees on the summit of Mount Mitchell. This is one of the local names for this little-known tree, which also has been given a number of other names alluding to its properties.

The Lash-Horn Tree

By W. L. McATEE

MORE than forty years ago, Judge G. W. Hinshaw of Winston-Salem, North Carolina, speaking of Whitetop Mountain, Virginia, told me: "They have a tree up there called the lashorn or lash-horn tree." For me, a lover of local names, that started a search, which in time yielded information on the identity, natural history, and uses of the tree, but none about its interesting name. Old-timers have been interviewed; botanists and linguists have been consulted; but no one has been able to throw definitive light upon "lash-horn."

Hence, I was glad to receive a theory as to the origin of the name from a fruitful correspondent, Miss Zeta C. Davison, who has long worked among the people of the southern Appalachians. "As you know", she writes, "they use the 'milk' from the blisters on the bark of the tree for healing cuts and other wounds. So, I wonder if the first settlers called it lesion balsam. In time, as the younger folk came on, they might have mispronounced lesion as lasion, lashun, and finally lashorn and lash-horn. This may sound far-fetched but so is 'Jewslly Moke' for Jerusalem Oak, and that took me five years to trace." Such modification of words is called folk etymology, and from lesion to lashorn seems no more remarkable a transformation than that Miss Davison cites, or that illustrated by two other examples she has supplied from the same region,

namely, "Our Beauties," for arbutus, and "Aunt Jericho," for angelica.

Other folk names for the lash-horn, include several alluding to the medicinal properties of its resin, as — balsam, black balsam, healing balsam, mountain balsam, balsam fir, and she-balsam. The last term is in distinction to he-balsam applied to the red spruce and refers to the liquid resin or "milk" that the balsam produces, but the spruces lack. It is also called double fir and double spruce from having leaves all around the branches, not mainly in two opposite ranks as in the spruces. Two additional folk terms are blister pine from the resin pockets in the bark; and stackpole pine because farmers use straight, light poles cut from it as "backbones" for haystacks. Bookish appellations include: Eastern fir, Southern balsam fir, Fraser's fir, and Fraser's balsam fir. The last two names, as well as the scientific designation, *Abies fraseri*, commemorate John Fraser (1750-1811), Scottish horticultural collector, who made several expeditions in the south-eastern States, and was the first to bring this species to the attention of botanists.

The tree ranges from the Virginias to North Carolina and Tennessee, from elevations of 3700 feet in the north, and 4000 feet in the south, to the tops of the mountains. Like most woody plants of that habitat, it is often dwarfed by severe conditions, but in favorable places



Twig and cones of the lash-horn. The scientific name of the tree is *Abies fraseri*, or Fraser fir, being named for John Fraser, Scottish horticulturist and collector.

may attain a height of 70 feet, and a diameter of $2\frac{1}{2}$ feet. The foliage is dark green, appearing black at a distance, and its blanketing of the higher slopes has given rise to the names, Black Mountain for a peak, and Black Mountains for a range. The Balsam Mountains of North Carolina also are named for it.

The dense growth of the lash-horn has impressed all beholders, one averring that its canopy supports the snows of winter and shuts out the rays of the summer sun. Elisha Mitchell, for whom the highest peak in the eastern United States is named, and who was a scientific explorer of the Carolina mountains, long ago wrote: "The growth of the tree is such on these high summits, that it is easy to climb to the top and taking hold of the highest branch look abroad upon the prospect." More explicit is Charles B. Coale, who is authority for use of the name lashorn on Whitetop Mountain in the 1870's [another says it goes back to the early 1800's]. Coale said: "Where not crowded [these trees] ... are perfectly flat on top, spreading out to a diameter of from fifteen to thirty feet. ... The limbs at the top are ... so closely interlaced that the writer has seen as many as twenty persons standing and stepping about the top of the same tree at [one] ... time. It is very easy to ascend and descend as the limbs usually begin at the ground, and being cut off about a foot from the trunk, a very convenient 'Indian ladder' is formed, and then a hole being cut through the foliage in the centre of the top, it is not difficult for even a lady to ascend and step out upon the [springy] ... platform." It seems likely that this description applies to trees closely pruned and shaped by wintry winds.

The bark peels easily from a green tree and a roll of it has often been known to serve a hunter for a night's shelter. It varies from cinnamon to gray in color, according to age. The resin, a thin, yellowish, translucent liquid (not whitish as the local name "milk" would imply) collects in blisters in the bark of young

trees and near the tops of older ones. It is gathered by extemporized means, as by tapping the lower part of a blister with a knife, then pressing the fluid out into a tin container held tightly against the bark. The resin pockets vary in size up to that of a common marble. Whatever portion of this product may reach the market, it doubtless is merged with the stock of the well-known Canada balsam (obtained from a related northern species), with which it has similar qualities. Because it remains permanently transparent and has about the same refractive index as glass, it is used for mounting microscopical objects and for cementing lenses in optical work. Despite its commercial value, much of the harvested southern balsam remains in the mountains, where it is regarded almost as a panacea, being used in the treatment of rheumatism, flux, and kidney trouble, and universally for healing cuts, other wounds, and open sores.

A few relations of the lash-horn with wildlife have been recorded; for example, it has been said that where the balsam growth begins in the mountains, the existence of poisonous snakes ends. That may be another way of saying that a higher life-zone supervenes, or, more likely, that exclusion of ground cover by the shade of the balsams is unfavorable for snakes. The Carolina junco frequents the lash-horn country, both winter and summer, in the latter season singing its simple, tinkling lay and rearing its young in this analogue of the more northern range of the slate-colored junco; both are known as snowbirds. The "mountain boomer," or red squirrel, is fond of young balsam cones, and in early summer congregates in the forest, snipping off the cone-bearing twigs until the ground is littered with them.

Here is the story of a little-known tree. Whether or not lashorn derives from lesion, that theory is the best I have received. If any reader has one deemed more satisfactory, I shall be glad to hear of it.

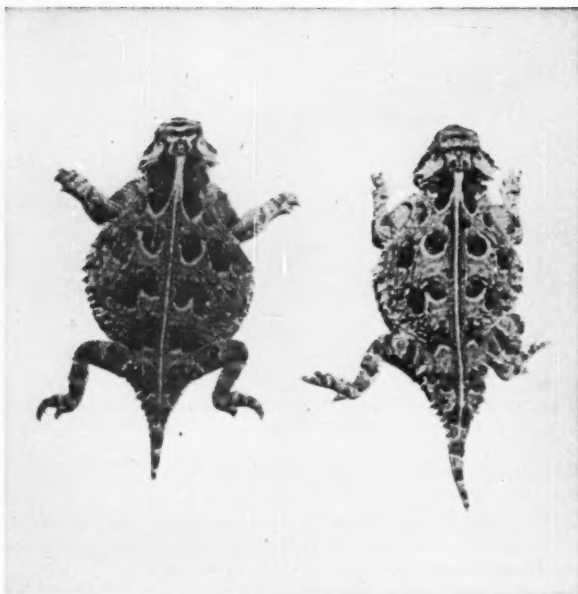


Some Horned Toad Facts

By SHERIDAN H. LEE

ON THE plains of Texas there is very little rainfall but plenty of sunshine. If, at noon when the sun is pouring down its brightest rays, you happen to be walking through a pasture or wasteland, or even across an empty lot around the street corner, you may see some queer looking animals darting away from your very feet. They are not large; most of them measure about three of four inches in length. Nor are they very fast; you can overtake them easily. They do not bite nor do they sting. Their short claws are never used to hurt anybody. But they are seldom molested by any animal, except small boys or biology students on field trips. Their security is achieved mostly by their spiny bodies and spotted color pattern. The former characteristic will make any flesh-eating animal think twice before attacking. Also, their diurnal way of life almost forbids any chance of contact with nocturnal carnivores. Their mottled appearance evades the winged predators. Aerial photographers claim that they are one of the best camouflaged animals. One cannot detect even a shadow in the most sensitive negatives. However, when attacked, they are the most helpless animal known to the author. They simply flatten the abdomen, close the tiny eyes, and wait for you to go away.

They look much like toads with horns on their heads. As a matter of fact, their common name is horned, or horny, toad. But in reality they are lizards, which means that they are more akin to snakes and turtles than they are to frogs and toads. However, they eat like frogs and toads; that is, by extruding their tongues. They eat only living prey, or, more accurately, moving prey. The size of their prey is limited. They never tackle anything bigger than the width of their mouths. The author once put several large, live, juicy grasshoppers in a pen of six horned toads that had not eaten for eight days. None of the horned toads showed any sign of interest whatsoever. One day later the grasshoppers were exchanged for several dozen big red ants. Immediately, all the horned toads came alive. They literally lapped up the ants within five minutes. George F. Knowlton of the Utah Agriculture Experiment Station suggested using horned toads as a control for pasture-destroying red ants. Although it is highly impractical to raise horned toads deliberately for this purpose, a little extra care and less unnecessary killing would surely be appreciated by our meek little neigh-



The Texas horned toad, *Phrynosoma cornutum*, the female on the left, the male on right.

bors of the high plains, and thus permit them to control insects as Nature intended.

One of the horned toads kept by the author has the habit of wiggling her tail whenever she catches her food. The motion is such that no one can fail to see that she is in ecstasy and filled with gratitude. Consequently, she is fed more often than any of the others.

One may wonder why I call this particular horned toad "she." It is easy to distinguish the sexes. In the photograph here, note that the thicker part of the proximal end of the tail is longer on the male, while the female's tail-base is shorter and tapers off gracefully into a triangle. Besides this, one may also notice that the male's coloration is a little lighter.

Dr. J. C. Cross, chairman of the Department of Biology, Texas Technological College, states that he once witnessed the mating of two captive horned toads. However, the author is less fortunate than Dr. Cross. According to Dr. Alvin R. Cahn, in 1926, the horned toad lays her eggs in tunnels, which she digs by using the claws on her feet and the horns on her head. The author has kept several egg-laden females. They all laid eggs at one time or another, but all the eggs became shriveled and dry. On July 2, 1952, a student brought in a female horned toad. Upon dissecting her on July 4, twenty eggs were found in her body cavity, ten in each uterus. All except one contained embryos. The embryo appeared as a red disc through the parchment-like shell, and all were living, for the heart beat could be faintly seen. The uterus resembled thin mesentery membrane, transparent, moderately supplied with blood vessels. It enclosed the eggs tightly.

Two of the eggs were opened to prepare the embryos for future study. The embryos were lying on top of the yolk just as do chicken embryos. Fourteen were put in a petri dish lined with wet paper towel and incubated at 30°C. Three were put in another petri dish, which was kept at room temperature. On July 5, the embryos in the incubator still showed signs of life, while the three kept at room temperature had lost the red discs. On the afternoon of July 6, all the red discs had disappeared and upon examination all the embryos were found to be dead. From this observation it would seem that the Texas horned toad, *Phrynosoma cornutum*, is not oviparous. The egg-laying of the other captive females was probably abnormal, since none of their eggs

hatched. The author believes that this was brought about by malnutrition. Raymond L. Ditmars stated in *The Reptiles of North America*, that all horned toads are viviparous. The word viviparous is generally used to describe those animals which produce young that develop from isolecithal eggs retained within the mother's body and depend on her circulatory system for nourishment and excretion, as with most mammals. Obviously, this does not apply to the method of reproduction of the Texas horned toad. This species most likely reproduces as do many other reptiles, ovoviviparously, the eggs hatching within the body, for their eggs contain a great amount of yolk, and the embryos do not depend entirely on the mother for food.

Wood Violets *By* ELINOR HENRY BROWN

I knew
Where violets
Grew — long and long ago.
I'd find them, if I found the path
Again.

Flowering Raspberry

By EDWIN F. STEFFEK

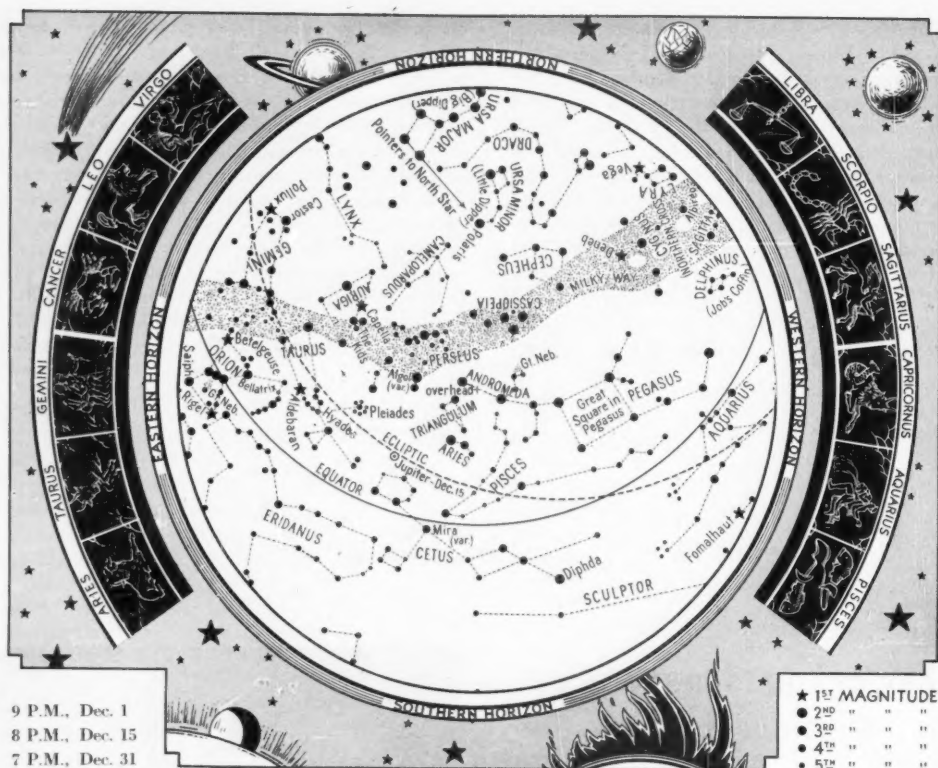
ALTHOUGH not as much sought after or as frequently picked as some of the better-known wildflowers, the flowering raspberry is, nevertheless, giving way before the onrush of man and his activities. Known to botanists as *Rubus odoratus* — the "fragrant" raspberry — it was once widely spread from Canada's maritime provinces west to Ontario and south to Georgia and Tennessee. Now, however, it is reduced to a remnant of its former distribution. Being primarily a shade-loving plant, it has suffered heavily from the cutting of the woodlands and clearing of the land.

It is, however, the most showy member of the clan, at least as far as individual blooms go. The flowers are rosy-purple, up to two inches across and are borne in loose clusters from June until September. The leaves are large, maple-like and are borne on densely bristled stems from three to five feet high. The plant grows in rocky woods and thickets, but occasionally, also, in the sun in wet places. The fruits, which are flattened red berries, have often been described as insipid or scarcely edible. They appear along with the flowers, from July until fall, and are, to me, rather pleasant eating.

If the plant is slowly disappearing in many places, it is not because it does not fight back. With half a chance, it spreads rapidly by means of suckers from the roots, which gives a clue to one method of propagation. Another method is root cuttings, and a third is seeds sown as soon as ripe and left out of doors all winter.



The only protection the plants need is protection from rodents or from washing away. Thus, with half a chance, it is one of the easiest natives to restore, either in the wild garden or in likely haunts elsewhere. As an added attraction, as a fruiting plant, it attracts birds.



To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then, below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. It will not be necessary to turn the map if the direction faced is south.

Searching the Skies

By ISABEL M. LEWIS

TODAY, as never before, the heavens are under constant scrutiny, both by day and by night. Professional astronomers are mapping the heavens with powerful wide-angle lenses that reveal objects in some instances never before recorded. The great 200-inch Hale telescope on Palomar is penetrating into regions of space hitherto unseen by human eye, either visually or on the photographic plate. In the comparatively new field of radio astronomy new and important discoveries are being made. With special types of radio telescopes, and through experiments conducted both in Australia and England, as well as in the United States and Canada, long-wave electromagnetic energy that has its origin in galactic regions and elsewhere in the heavens has been detected and measured.

According to one theory these galactic radiations are produced by cosmic rays passing through magnetic

fields. They have been detected in the region of Cygnus, Cassiopeia, Orion, Taurus, and particularly in the direction of the center of our galactic system in Sagittarius. The only visible object with which these cosmic radiations have been definitely associated is the Crab Nebula in Taurus. This gaseous nebula is thought to be what is left of the great supernova observed in the year 1054. Its brightness at that time was said to equal that of the planet Jupiter. The distance from the earth of this remarkable nebula is about 4100 light years. Displacement of spectral lines in this nebula show that it is expanding at the rate of about 800 miles a second.

Among amateur as well as professional astronomers great interest has been shown in the observation and recording of the flights of meteors, sporadic, as well as periodic swarms of meteors, and the larger, more widely

observed, fire-balls. New methods of detection and observation of meteors have been devised. Here again radio has been most helpful. Echoes of short-wave radio pulses come from the ionized trails of meteors, and observations may be made on motion picture film, as well as visually. In three different ways it is now possible to observe the flight of meteors through our atmosphere — visually, photographically, and by radar. By means of what is known as a "meteor trap" a trail of a bright meteor is recorded by two cameras with wide-angle lenses that are some distance apart but directed toward the same region. The trail of the meteor recorded in both cameras is broken at one-twentieth of a second intervals by rotating shutters in front of the lenses. In this way it is possible to estimate the velocity of the meteor at a definite height in the atmosphere, and to learn something about its orbit and whether it is a member of our solar system or has come from space lying beyond it.

It is most probable that meteors are associated with comets, either following along in orbits of some comets, if travelling in swarms, or possibly just particles of matter, dust-like in substance, that must exist in our solar system in enormous quantities. Many fainter meteors that do not even produce visible trails in passing through our atmosphere may still have radio echoes from ionized clouds surrounding them. Such echoes have been recorded from meteors travelling in periodic swarms. Meteors that produce bright trails as they pass through our atmosphere are generally no greater in size than the head of a pin. It has been estimated that millions of such particles enter our atmosphere daily. The sporadic meteors are similar in kind to the particles that travel in well-defined orbits and encounter the earth in its orbit each year on definite dates.

There is some difference of opinion as to whether the great meteorites that actually strike the surface of the earth and which are of two kinds, stony or nickel-iron in composition, weighing in extreme instances several tons, are simply exceptionally large meteors or have a unique origin. Often they, too, appear to travel in groups and in falling are scattered over a considerable area. It is possible, though not likely, that they may be large-sized masses from the head of some depleted comet. It is also possible that an individual meteorite may become broken into pieces as the result of an explosion accompanying its passage through the earth's atmosphere and the fragments will fall to the surface.

Individual meteorites have been recovered from about 1500 falls, and new falls appear to be occurring, it has been estimated, at the rate of about 25 a year. A list of about 30 known meteorites that weigh more than a ton has been published by Frederick C. Leonard of the University of California at Los Angeles. The

largest of all meteorites, weighing about 60 tons, is the Hoba West meteorite of nickel-iron. It still lies where it fell in southwest Africa. By far the greater number of meteorites consist of nickel-iron. The largest meteorite ever seen to fall, however, weighed about a ton. It struck the earth's surface in Furnas County, Nebraska, on February 18, 1948. The largest known meteorite in this country is of nickel-iron and weighs $36\frac{1}{2}$ tons. It is one of four found by Peary in 1895 near Cape York, Greenland, called the "Ahnighito." It is in a collection that contains another great meteorite, weighing

15 tons and known as the Willamette meteorite, which was found in a forest in Oregon. This collection is at the Hayden Planetarium in New York. Museums all over the world contain specimens of meteorites. The peculiarities of meteorites, iron or stony, readily distinguish them from stones of terrestrial origin.

There appears to be no evidence that anyone has ever been killed or injured by the fall of a meteorite, or group of meteorites, striking the earth's surface singly or in fragments. Falls have occurred mostly in desolate or sparsely settled regions. Great falls have been discovered in Greenland, Siberia, and Mexico, as well as in the United States and elsewhere. Most remarkable of all in many respects was the fall that occurred on June 30, 1908 in a dense forest in north-central Siberia. Sound waves from this fall spread to distances of several hundred miles from its center. Trees were stripped of bark and branches and fell in a direction away from the center of the disturbance. For twenty miles or more in all directions small crater pits and other signs of a great fall of meteoric masses were found by scientists drawn to the region by persistent rumors of some strange occurrence. Greatest damage was done, not by the actual fall of these masses, but by the atmospheric disturbances and concussions set up by their passage through the air and the partial vacuum created along their paths.

In these days, when the skies are under constant scrutiny by day as well as by night, and when tales of "space ships," and "flying saucers," have created an abnormal interest in any unusual bright object in the sky, even an innocent meteor or fire-ball cannot escape suspicion. If the great Siberian meteorite had fallen on Manhattan, instead of in a densely forested area in Siberia, it would probably be attributed at first to an enemy attack with some strange, new weapon. Panic and fear aroused would far exceed the material damage done, — although that would be great, indeed, in an area so thickly populated. The devastation that resulted from the Siberian fall was exceptionally great, and a direct hit was evidently scored on the earth by either a cluster of small meteoric masses, or a single large mass whose orbit passed too close to our planet to escape collision with it. (Continued on page 552)

Viewpoints

By ELINOR HENRY BROWN

Two ways

To look at sky;

Up through tall pines, or down

Through ferns—where stars glint from a deep

Still pool.

The School Page

By E. LAURENCE PALMER

Professor Emeritus of Nature and Science Education, Cornell University, and Director of Nature Education, The American Nature Association

MEETING TIME

PROFESSIONAL meetings may be of little value to teachers, or they may be of much value. They may also be of some value to those who take active part in the programs. The fall months seem to be particularly suitable for teachers meetings, and this fall I expect to have more than my share of them now that I have assumed the position of a retired professor. Shortly after I finish this page I shall be taking to the road, representing the American Nature Association and the National Wildlife Federation at a series of meetings extending almost from coast to coast. I have already taken in a generous number and some of them have been really worth while.

Following a session in the hospital this summer, I have attended meetings in Indiana and New York; and before I see a snow storm will have worked with groups of teachers in Virginia, Georgia, Tennessee, Oklahoma, Texas and other States. I hope also, to spend about two weeks in Mexico visiting schools, and, on the side, collecting a few shells. I will return home in time to get down to St. Louis for the Christmas meetings of the American Nature Study Society, the National Association of Biology Teachers and the National Science Teachers Association. One or the other of these societies will be involved in each of the meetings I will attend in the South. I will spend the winter at my home in Ithaca, New York, where I can enjoy the winter weather and hope to get to the Northwest and West sometime during the summer. I think that this may be a good thing for me and for what I write for you on this page. True, I have visited schools in every State of the Union, but I have not had the freedom to move as seems best, as is now the case. I hope, through the pages of *Nature Magazine* and the publications of the National Wildlife Federation, to provide a service to teachers somewhat along the lines I have followed in the Cornell Rural School Leaflet for New York State for more than thirty years. This widening of my audience will be — and already is — inspiring to me, at least, and I am anxious to get into the swing of the program.

I plan to report to you the highlights of these meetings as I see them. I shall try to be candid and honest in my observations, and hope that the net result will be constructive.

One of the most distressing things about most teachers' meetings centers around the great heterogeneity of the average teachers' audience. A year ago in my school page on "Field Trips de luxe" I reported in considerable detail on the reactions of the teachers at one meeting to the field trip idea. A year earlier I reported similarly on other meetings. This last major group of meetings that I have attended brought out another observation. While the meeting was for teachers of science and conservation, there was little or no evidence that the leaders or teachers had any consuming interest in getting down to earth. One meeting was directed primarily to getting a huge financial support from a major foundation. The stage was all set for the visiting big boys, and the papers presented were kept religiously in a pattern, which, I assume, had been agreed upon before. Probably the most amusing incident of the meeting took place within a few minutes of the time when a free discussion was allowed. One gentleman arose and asked point blank just what was the proposition the foundation had made to the group. It was obvious that no proposition had been made, but rather that it was hoped that one would be made. A question asked was, I would assume, about the last thing that was desired by the "steering committee."

Following this for two days, we had an interesting time, even fun, but, in my judgment, did not get far. I say we had fun, but I mean that we who had the perspective of previous meetings had fun listening to the group reach essentially the same conclusions we had reached as groups in previous years. This was spiced now and then by a few speakers who were ready to talk on any subject so long as they could talk at length on it, and they managed to talk on practically every topic that was developed. Interspersed with these rambling rovers were a few talks by persons with remarkable ability to say something profound and full of meat in exceptionally few words. These were the people that made the meetings click.

It is fun in meetings of this sort to sit back and watch the crowd; to try to estimate just how much different individuals must be getting from the experience; to try to form some judgment as to what their thoughts may be if they have any. There are the paper readers, the knitters, the doodlers and the sleepers. At the last meeting I attended one of the sleepers fell off his chair and pulled out the connection to the loud speaker system and so wrecked it that we had to get another outfit. I get fun glancing at the notes some of my neighbors make at some of these meetings, and it is always revealing to pick up an abandoned program to see what the owner may have thought worthy of writing down for future reference. No doubt my ramblings into the realm of trying to see what my fellow sufferers at some meetings may be doing should be as unforgivable as falling to sleep and snoring, which I must admit I have myself done a few times. When I was a youngster I used to amuse myself and keep myself awake in church by counting the panes of glass in a given window, estimating the number of windows in the church and doing a little mental arithmetic to estimate the total number of panes of glass in the church.

The fact remains, though, that in most teachers' meetings nowadays the programs are interesting enough and well planned enough to reduce to a minimum such extraneous activities. I usually count it a success if I can get one or two good ideas a day that are important enough for me to remember without having to take notes.

I can not leave this consideration of meetings without commenting on how frequently the discussions have little or no bearing on the announced topic. Within the month I attended a national meeting where it was announced that there would be a symposium on urban ecology. I thought that I might get some ideas on the ecology of swimming pools, kitchen sinks, pigeons and rats as well of human beings themselves. Instead, all we got was the statement from the major speaker that he lived in a city, but did all of his work in the country, so then we went on to the usual story if the ecology of fresh-water streams, lakes and ponds, with which most of us associate his name anyway. I could not help but feel that he had merely pulled one of his college lectures out of the barrel and handed it to us.

I have reason to suspect that the Christmas meetings of the American Association for the Advancement of Science at St. Louis will be sufficiently stimulating to avoid criticisms such as I have made in the two preceding paragraphs. I have seen two of the programs of two of the science teaching societies and am delighted to see some of the speakers that are being brought to these meetings. Professor Fuller from Illinois, for example, has not to my knowledge spoken to the science teacher groups at the Christmas meetings before. Those of you who have heard him, or have read his articles, particularly in *The Scientific Monthly*, know what you have in store. You may not agree with some of his ideas, or on his methods of getting attention to his convictions, but you won't go to sleep or doodle when he is telling his story. I could mention others you will want to hear.

I still think that all teachers' meetings should have at least one good practical field trip. At the A.I.B.S. meetings at Cornell in September I took a group on such a trip over territory that I have known for thirty or forty years. We stopped at a young alder to notice a colony of alder blight aphids. I told the group that such colonies were often parasitized by the insect-eating caterpillars of the wanderer butterfly. No more had the words come from my mouth than a wanderer flew up, laid an egg and continued to lay eggs in the colonies as long as we stayed to watch.

If I had planned it it could not have worked better. I contend that those who saw this thing happen will remember it longer than anything else they got from the three-day session. You cannot plan for such things, but you can be alert to make the most of them when they happen. I am not sure that a teachers' meeting without some demonstration teaching, without some practical development of a situation on the spot is worth while. We need the profound personalities who can spellbind us or stir up our convictions, but I believe it is just as profound to be able to see and interpret an immediate situation anywhere. The flies on the window, the sunlight on the wall, the cobweb from the ceiling, the warped table top and the knot hole in the woodwork all are as worthy of our attention as Spirogyra, the sewage disposal plant, the cross-section of a leaf on a microscopic slide, or a cast of an onion root tip. See if your next teachers' meeting does help you understand the place where you work. Evaluate it on that basis.

Teachers' meetings and teachers' workshops are being sponsored by a variety of organizations. Usually these are under the guidance of tax-supported institutions, or are entirely underwritten by your tax money. Some are self supporting through fees and other charges. Some are supported by non-profit organizations. Last year the National Wildlife Federation, through its grants-in-aid program, gave help mostly to teachers' groups in 23 states. This year a somewhat similar program is under way, but applications for this help must be filed with the proper data, with the Federation in Washington, D. C., by the middle of January. In New York State, through these grants, we have reached teachers in all but eight of the non-metropolitan counties. Write me if you want further help.

Canoe Country Film

The list of excellent outdoor motion pictures is constantly growing, but one of the outstanding ones still remains "Wilderness Canoe Country," the fine documentary film about the superb wilderness of the Quetico-Superior in northern Minnesota and contiguous Ontario. This colorful, 16 mm. film runs thirty minutes and has a fine sound commentary. It was produced under the auspices of The President's Quetico-Superior Committee, 919 North Michigan Avenue, Chicago 11, Illinois. Information about rental of the film or purchase of a copy may be obtained from that Committee.

From Denver

Two new booklets in the excellent "Museum Pictorial" series being issued by the Denver Museum of Natural History, City Park, Denver, come to hand. Both of these are the work of Alfred M. Bailey and are illustrated by many of his fine photographs. Number 6 in the series is entitled "Laysan and Black-footed

Albatrosses," and is priced at one dollar. Number 7 is "The Hawaiian Monk Seal," and is available for fifty cents. Anyone ordering one or both of these is asked to add six cents for postage.

Can You Help?

Recently the Tidewater Council of Natural History was formed in affiliation with the Norfolk Museum, Norfolk, Virginia, to encourage interest in natural history and conservation. We have a letter from W. F. Rountrey, Chairman of the Council, asking whether members of the American Nature Association and readers of *Nature Magazine* might have specimens of natural history interest typical of the Tidewater area. The Council recognizes that accumulating a representative collection will take time and would appreciate any help that might speed it along in its work. The address is Norfolk Museum and the Myers House, Norfolk 10, Virginia.

Gregg Advanced

H. Raymond Gregg has been promoted to the position of assistant chief naturalist of the National Park Service, and will assist John E. Doerr, chief of the Natural History Division. Mr. Gregg joined the National Park Service in 1933, serving successively as park naturalist at Hot Springs, Rocky Mountain and for the National Capital Parks.

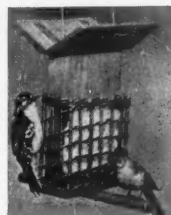
Hague Meeting

"Proceedings and Papers of the Technical Meeting Held at The Hague, September 20 to 22, 1951," is the title of the latest publication of the International Union for the Protection of Nature, 42, rue Montoyer, Brussels. This is a compilation of the discussions and the papers presented at this interim meeting held during the years between the General Assemblies of IUPN.

Whooping Crane

The Whooping Crane. By Robert Porter Allen. New York. 1952. National Audubon Society. 246 pages. Illustrated. \$3.00.

This is Research Report No. 3 of the National Audubon Society, the earlier two reports having dealt with the ivory-billed woodpecker and the roseate spoonbill. This present report is concerned with the second rarest species of North American birds, a bird that has been pushed to the verge of extinction by the hand of man, both from excessive killing and usurpation of habitat. In this fine study of a magnificent member of our avifauna, the author presents its whole story, its history, former distribution, progressive persecution and migration. Information on its life habits and food requirements are set forth, and, finally, data on the bird's present situation and its hope of survival, principally on the Aransas Wildlife Refuge in Texas. This is a distinguished work.



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Camera Trails

By
EDNA HOFFMAN EVANS

A GLANCE at the calendar will reveal that it is time to do more than just think about Christmas shopping. It is time to shop and to buy, if we are going to have all the names on that list checked off before old Saint Nick starts on his midnight ride.

Nor will it be out of order to drop a hint now and then about our own Yuletide wishes, providing we happen to see something particularly appealing while we are going the rounds.

For camera fans, the photographic supply stores are always full of intriguing possibilities. That is true twelve months out of the year, but around Christmas time even the camera shops add extra attractions in the form of special gift wrappings and special sets of various kinds—camera-film-and-flash kits, darkroom supplies for the beginner, extra gadgets for the more advanced amateur, and the like.

As usual on our holiday tour, we can start with cameras. Are there any new possibilities on our list this year?

Not exactly a newcomer, but now available in new form, is the Ansco Readyflash camera. Last year it was available only as part of a complete outfit—camera, flashgun, accessories and gadget bag. Now it can be bought with or without the other accessories.

The Ansco Readyflash is, according to its makers, considered to be the lowest priced, good, fixed-focus camera with flash attachment available. It uses 620 film, gives eight album-sized prints, and is small and compact enough to fit in anywhere. Available at nearly every photo store or photographic counter, the camera retails for \$6.30, including tax. The flash unit for it is listed at \$2.75.



The Ansco Readyflash Camera.



The Kodak Retinette Camera.

Somewhat higher priced but still within the price range of most interested amateur camera fans is the new Kodak Retinette camera, recently announced by Eastman.

The Retinette is a 35mm camera, designed for both indoor and outdoor picture taking. Its shutter speeds range from one full second for critical indoor shots to 1/300th of a second for action photography, plus a delayed action setting that allows the cameraman to get in front of the lens, too. Built-in flash synchronization covers both class M and class F flash lamps, plus X-class speed lamp equipment.

Another feature of the Retinette is a Schneider Reomar 50mm, f/4.5 coated three-element lens, having diaphragm stops down to f/16. In addition to automatic film stop, counter, and double-exposure prevention controls, the camera also will take a cable release and, if desired, a brilliant view finder, a clip for special accessories, and easy-to-check settings for aperture, shutter, and depth of field. The Retinette is priced at \$59.50. A leather field case is available, if desired.

Flash attachments seem to be the most numerous items offered in the accessory line. There is no doubt about it—flash photography is here to stay, whether you are shooting indoors, or outside in the sunlight. Flash bulbs, properly used, do help avoid unpleasant shadows. And, of course, they also provide light in places where photography would otherwise be impossible.

Eastman has a new Kodak Standard Flashholder that features a bracket designed to permit a rapid removal of the flashholder for off-the-camera work. Other features include an improved lamp socket and ejection system, better adaptability for use with extension units, and a battery positioning system aimed at insuring good electrical contacts regardless of variations in the length of batteries used.

The flashholder uses midget flash lamps

of the SM and No. 5 types, can be powered with two "C" cells or a Kodak B C flash-pack, is wired in series, and has an exposure table on the reflector. (This latter is mighty handy if your memory for numbers is as faulty as mine.) The price, which includes a two-way flashguard, is \$8.25.

The Kalart company of Plainville, Conn., which specializes in the manufacture of synchronized range finders and speed flash synchronizers, announces three new flash models designed for particular makes of cameras. These models are the BCA-3 for Argus C3 cameras, the BCA-4 for the new Argus C4, and the BCLC for all Leica III F and II F cameras with built-in flash synchronizers.

All three are members of the Kalart B-C flash unit family, which features extra power and lighting control for both black-and-white and color pictures, plus the built-in test light (exclusive with Kalart B-C) which lets the photographer know for sure before he shoots that the flashbulb and firing system are all right.

Each of the three models comes with battery, capacitor, concentrated reflector with patented lamp ejector, camera attaching bracket and connecting cord. Each is priced at \$14.30.

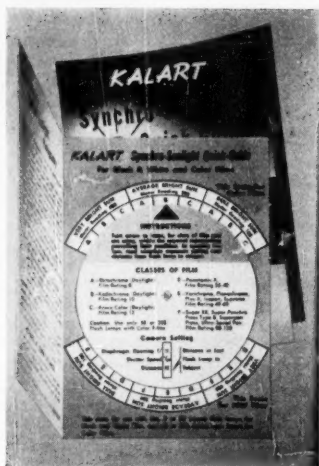


Kodak Riviera Protecto Albums come in several styles.

For people who have not quite mastered the art of taking good flash pictures in daylight, Kalart also has an inexpensive Synchro-Sunlight Guide that will make a nice present by itself, or that can be tucked in with something else. The guide gives, at a glance, all the information needed for proper balance of light. It is easier to use than flash guide numbers because it gives exact shutter speed, exact diaphragm opening, and correct distance from flashbulb to subject for all types of conditions combining daylight with flash photography.

The Kalart guide is a pocket-sized affair, printed on heavy board with varnish finish. Available at most camera shops, or direct from the manufacturer, it costs only 25c.

For amateur darkroom enthusiasts, a Christmas present that will be very useful to the receiver and yet easy on the giver's pocketbook is the Kodak 2-way safelight. It can be used with either one or two safelight filters, can be screwed into an overhead or a wall socket, and can be used to illuminate either a general area, the entire



Kalart Synchro-Sunlight guide to help with outdoor flash photography.

darkroom, or a specific working surface such as a sink or table top.

The safelamp is supplied with one 3 1/4 x 4 3/4 inch Wratten series OA safelight filter, and a 15-watt, 110-130 volt lamp. The price is \$4.50 at all Kodak dealers.

A particularly nice gift for the photographer who likes to show his pictures in album form is the new line of Protecto type snapshot albums made available by Eastman. These Kodak Riviera Protecto albums have simulated leather covers with alligator-type finish and a decorative 24-carat gold band. They are available either in blue cover with gray paper leaves, brown cover with brown paper leaves, or red cover with gray paper leaves.

A nice feature of this type of album are the clear plastic folders, with paper inserts, bound directly into the multi-ring binder. Pictures slip inside the folders for protection. Small prints must be pasted or otherwise held in position, while the large prints fit nicely without pasting. The twelve folders per album will hold up to twenty-four 8 x 10 prints, or an equivalent number of smaller prints. Extra leaves and folders are available. The albums are priced at \$8.50 each.

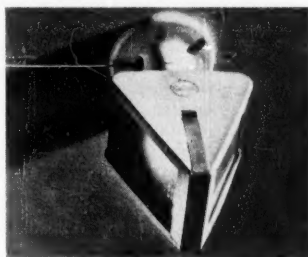
For specialized gifts, there are two new handbooks, one designed for industrial and the other for professional photographers. Sections in the industrial handbook are: Microfilming with Kodagraph Micro-file Equipment and Materials; Photography Through the Microscope; Making Service Pictures of Industry; and How to Use Kodagraph Reproduction Materials. In the professional handbook are: Camera Technique for Professional Photographers; Negative Making for Professional Photographers; Use, Maintenance and Repair of Professional Equipment; and Professional Printing with Kodak Papers. The handbooks sell complete for \$4. The individual data books in them may also be purchased separately for 50c each.

If your cameraman likes books, here is another suggestion. The new book, *Bigger and Better, The Book of Enlarging*, by Don Nibbelink, is designed for the amateur who has progressed beyond the snapshot stage and who wants to do his own developing, printing, and enlarging. It has eighteen chapters and more than 100 illustrations, dealing with negatives, papers, solutions, beforehand planning, step-by-step procedures, and after-printing analysis. The book, which is available at most camera shops, sells for \$2.95.

Three more gift possibilities before we bring this present Christmas shopping tour to an end:

For the picture taker who does not want to develop film, but who does want to print his own pictures, there is the Kodacraft printing kit No. 611. It contains three trays, a thermometer, graduate, chemicals, stirring rod, a supply of Kodak Velite paper, printing frame and mask set, and instructions on how to make prints. The price is \$4.95.

For the slightly more advanced picture taker who wishes to process his own film in addition to making prints, there is the Kodacraft photo-lab outfit No. 612. This includes a Kodacraft roll-film tank with three aprons, film clips, and other useful accessories, in addition to the materials included in kit No. 611. Its price is \$8.75.



The Kodak 2-way safelight.

The third kit is the Kodacraft advanced photo-lab No. 613. This contains a safelight, a Kodacraft metal printer, and other accessories for all types of amateur developing and printing. It costs \$14.10.

And with these we will conclude our shopping spree. Of course there are scores of gift possibilities that have not been mentioned. These are the old standbys like trays, holders, timers, paper cutters, easels, and the like, more expensive equipment-like enlargers and special lenses, as well as unromantic but necessary items like film, paper, and chemicals.

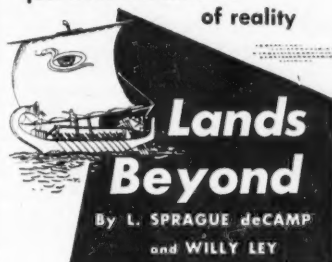
Here is hoping your Christmas will be a happy one, and that you and Santa will find just the right gifts for everybody.

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If so, why not plan to enter the eighth Chicago International Exhibition of Nature Photography, sponsored by the Chicago Nature Club and the Chicago Natural History Museum? Deadline for entries is January 17, and entry blanks may be obtained from H. J. Johnson, 2134 W. Concord Place, Chicago 47, Illinois.

There are two divisions, one for prints and the other for transparencies, and each division has three classifications — animal life, plant life, and general. There is an entry fee of \$1 for each division. Silver medals and ribbons will be awarded to winners in the various print and slide classifications, and accepted contributors will be eligible for listing in *Who's Who in Nature Photography*.

Do not forget the deadline — January 17. Write soon for your entry blanks. Please mention "Camera Trails" when you do.

BIRTH OF A LAKE

(Continued from page 516)

The forces that brought about the wholesale destruction of the small rodent population, drove the ground birds and small insect-eaters out of the mesquite covered valleys, and drastically changed the status of several larger mammals, created a wonderful habitat for many kinds of water birds. In the long run, it may prove a blessing to those species of animals so hard hit in the early stages of the rise of the lake. Given time, it seems certain that new plant jungles will develop, furnishing homes to replace those destroyed by the rising waters. Whether these will come fast enough to save the remaining animals existing in the sparsely vegetated washes is problematical. Certainly those that survive the present ordeal will be worthy representatives of their race!

SCARLET PASSION- FLOWER

(Continued from page 525)

as a man eats a granadilla. Probably the seeds themselves would pass undigested through the squirrel's stomach and bowels, thereby disseminating the vine. His forepaws and chin dripping with the sticky pulp, the little beast reminded me of a boy blissfully immersed in a juicy mango, forgetful of the cleanliness of his face and clothes. He continued at his feast for many minutes, until he had quite consumed the contents of the fruit — a big meal, I thought, for so small a stomach. His feast over, he carefully wiped his dripping chin by rubbing it against the rough bark of the great vine on which he had been sitting, then scrambled up the long, slender trunk, and hopped away through the tree-tops.

The somewhat unpleasant odor of the rind had in the past deterred me from eating the fruit of the scarlet passion-flower. But the squirrel had so obviously enjoyed it that I decided to sample it for myself. I found that it had a pleasant acid-sweet flavor, but was not quite so agreeable as the common cultivated granadilla.

STRANGE RELATIONS OF BIRDS AND INSECTS

(Continued from page 528)

of protection."

As a striking sidelight, he adds that most of the African birds in question appear to use protective alternatives — either associating with man or building over water; normally building over water but occasionally associating with wasps; and either building alongside insects or adopting the nest of another bird whose architecture is more protective.

Sometimes, it appears, a bird may improve on the use of an alternative by adopting two protective devices at the one time. In North Australia, for example, the large-billed warbler is so addicted to building over water, and has so strong a fancy for material resembling debris, that it is commonly known as the "flood-bird;" and yet it also takes the precaution, quite frequently, of placing its nest close to a colony of wasps.

Similarly, an Australian naturalist wandering in the far northwest found several nests of the buff-breasted warbler overhanging water, and two of them were built with the opening only about twelve inches from large nesting colonies of wasps. "Close examination," the observer wrote, "convinced me that such sites were chosen, after sound reasoning, as a protection against intruders."

Possibly, too, we should regard as a double protective device the practice of the black-throated warbler of not only suspending its nest from a thorny lawyer-vine, but selecting a vine that already carries a wasps' nest.

Is there, one wonders, some significance in the fact that most birds that adopt wasps are species that favor thorny bushes or prickly vines for nesting purposes? Maybe there is. At all events, many records from both South American and Central Africa refer to bird-wasp associations in thorny shrubs — which appear to be especially abundant in Africa — and as the same point obtains to some extent in Australia, it seems that in this matter, as in certain other aspects of the general problem, we get beyond the bounds of coincidence.

Numerous examples of bird-wasp and bird-ant associations were given Mr. Moreau by the late Dr. J. G. Myers, for several years ecological adviser to the Government of the Sudan, and most of

them related to thorny bushes. Dr. Myers found, in fact, so many examples of the kind with certain "thorn-conscious" birds that he gave up recording them. In some instances there were several birds' nests and several wasps' nests in the one bush. Sometimes one nest actually touched the other.

It seemed to Dr. Myers that the birds in question — those that frequently associate with aggressive insects — adopt a "deliberate lack of concealment," and, as another intriguing fact, he remarked that most of the birds, as well as most of the wasps, are "warning-colored." Also, he added the definite opinion that the activities of the birds are both recognized and tolerated by the wasps, and by ants and bees, as well.

Those statements are sweeping. They may seem to go too far; they may credit birds and insects with reasoning powers that they cannot possibly possess. But — well, what other conclusions can be drawn from the evidence? Indeed, the whole subject presents us with quite a lot of challenging questions. Here are some of them:

How do the insects differentiate between birds and other creatures? How do the birds "know" that the insects have protective power? Have the birds learned throughout the ages the value of stinging or thorny protective devices, used either singly or doubly, and if so why do not all birds of the one group make use of them? Why, in Australia, are bird-wasp associations restricted to warblers and yet not consistently practised in the group?

For another puzzle, why are examples of the practice much more abundant in Central Africa and South America than in any other countries? And, above all, why do the insects tolerate the birds when the advantage, if any, appears to be entirely one-sided?

All of these problems remain obscure. They are as puzzling as the many questions associated with "anting" — the practice followed by some birds of rubbing live ants on their bodies — which is a queer development that is far too intricate to be examined in a general discussion of bird-insect associations.

No naturalist, as far as records reveal, has been able to return anything in the nature of definite answers to any of the major questions here submitted. In such circumstances, of course, the only reasonable thing to do is to pass the puzzles on to someone else!

Honeybee

Honeybee. By Mary Adrian. New York, 1952. Holiday House, 51 pages. Illustrated by Barbara Latham. \$2.00.

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SEARCHING THE SKIES

(Continued from page 545)

No meteorite has ever been known to fall at the time of a shower of meteors and it is generally believed that they are of different origin.

The swarms of meteors that the earth encounters periodically are merely dust-like particles flaring up to incandescence for a few brief seconds when they are trapped by the earth's atmosphere, at the time when they and the earth arrive at the intersection of their orbits.

Periodic swarms encountered by the earth consist of debris following along in the paths of comets that are periodic and slowly disintegrating, scattering their substance along their orbits. There are many such swarms. In time many of them disappear as their orbits may be drawn away from encounters with our planet through the attraction of other bodies near which they may pass; or new swarms may be encountered.

A periodic swarm now recognized as of considerable strength is that of the Geminids. This is named, as is usual with swarms of meteors, for the constellation in which their radiant lies and from which they appear to come. They appear in greatest number, averaging about 30 an hour, on December 12, but may appear in smaller numbers over a period of two weeks. Gemini at this time rises well before midnight. Searching the heavens late in the evening one should be able to see swiftly darting members of this swarm, now and then, in the evening skies.

Venus is now becoming a resplendent object in the southwest for several hours after sunset. It will increase in splendor during the month as it draws farther away from the sun. Mercury is now in the morning sky at greatest western elongation on December 18, and may be seen around that time low in the southeast in the morning twilight. Mars passes from, Capricorn into Aquarius this month and may be seen as bright as a star of first magnitude in the southwest evening sky. Jupiter is now well up in the eastern sky at sunset and sets a few hours before sunrise. It brilliantly outshines all objects in its part of the heavens with unflickering yellow light. Saturn is still in Virgo to the northeast of Spica in the morning sky. It rises several hours after midnight in the southeast.

Winter will begin in the northern hemisphere this year on December 21 at 4:44 P.M., Eastern Standard Time, when the sun is farthest south of the equator, and summer begins in the southern hemisphere.

Bulletins

"Amateur Weatherman's Almanac," annual publication of *Weatherwise*, Franklin Institute, Philadelphia 3, Pa., \$1.00. A coordinated account of the past year's weather and concise instructional material to enable one to make a start at becoming

one's own weather observer and forecaster... "Fur Farming," "Farm Forestry" and "Soil and Water Resources," are reports on these subjects and value in Oregon, published by Oregon State College, Corvallis, Oregon... "Source Materials on Water Pollution Control," a bibliography prepared by the Division of Water Pollution Control of the U.S. Public Health Service... "Taxonomic Studies of the Rattlesnakes of Mainland Mexico" by Laurence M. Klauber is Bulletin No. 26 of the Zoological Society of San Diego, California. 143 pages, including plates... "The Common Loon in Minnesota" by Sigurd T. Olson and William H. Marshall is Occasional Paper No. 5 of the Minnesota Museum of Natural History, University of Minnesota, Minneapolis. Copies are available for one dollar from the Quetico-Superior Foundation, Room 1308, 347 Madison Avenue, New York 17, New York... "Southern California Deserts" describes these areas and their recreational significance. Supply limited, but published by the California State Chamber of Commerce, 350 Bush Street, San Francisco 4, Cal... "Sharptails into the Shadows?" by Frederick and Frances Hamerstrom and Oswald E. Mattson is a report on a grouse study published by the Game Management Division, Wisconsin Conservation Department, Madison 2, Wisconsin... "My Great Oak Tree and Other Poems" by Liberty Hyde Bailey is a "Keepsake" published by Chronica Botanica Co., Waltham, Mass., and available on request.

Scout Encyclopedia

The Boy Scout Encyclopedia. By Bruce Grant. Chicago. 1952. Rand McNally and Co. 160 pages. Illustrated by Jackie and Fiore Mastri. \$2.75.

Authorized and approved by the Boy Scouts of America, this book brings between covers information on all phases of Scout activity from Cub through Eagle rank. It covers the ideals of Scouts, their skills acquired through Scouting and the fun that they have. The book is of high value, not only to Scouts and prospective Scouts but to leaders. More than 450 subjects are covered and these are listed alphabetically from Ace Air Explorer to World Scouting.

Bible Plants

Plants of the Bible. By Harold N. Moldenke and Alma L. Moldenke. Waltham, Mass. The Chronica Botanica Co.; New York, Stechert-Hafner, Inc. 1952. 328 pages, and 95 illustrations. \$7.50.

Written by two distinguished scientists, this is the most complete and authoritative identification and description of plants mentioned in *The Bible*. Much has been written about this subject and a great deal of it has been conjecture or downright inaccurate. The book answers the questions caused by the lilies of the field, or the bulrushes in which the infant Moses

was hidden. Garden lovers and Bible students will find it a valuable and interesting reference work.

Mycology

Introductory Mycology. By Constantine John Alexopoulos. New York. 1952. John Wiley and Sons. 482 pages. Illustrated, with art work by Mrs. Sun Huang Sung. \$7.00.

This is a textbook for the student of mycology who knows nothing about the fungi and who needs an orderly presentation of certain fundamental facts on the structure and classification of these organisms in the form of broad concepts and patterns. Study of the fungi can be most bewildering for the beginner, and in this age of biochemistry there is even greater need for giving the tyro a proper introduction to this field.

Help Wanted

Frank Gehr, who lives in Harpersville, New York, has an outdoor radio and TV project on the fire. He writes us that he is looking for one or more persons with a spirit of adventure and willing to live in or near woods close to a wildlife domain. Photographic and journalistic ability would help. He will be glad to supply further information about his plans.

Book of Fishes

The Book of Fishes. Edited by John Oliver La Gorce. Washington 6, D.C. 1952. The National Geographic Society. 339 pages. 116 color paintings and 24 color pictures, with biographies of 236 species of fish and other aquatic life; 67 other colored pictures, and 170 in monochrome. \$6.50.

This is a new and revised edition, with much added material, of this valuable and attractive book. It brings together between covers outstanding articles on fishes, and pictures, that have appeared in *National Geographic Magazine*. This edition includes the better-known food and game fishes and other aquatic life of the coastal and inland waters of the United States. Both fishermen and those interested in fishes and their lives will delight in this volume, which, of course, provides in one book more colored pictures of fishes than any other volume. The articles used are varied in subject matter and present the drama of the waters in all its fascination.

Fauna of Britain

The Origin and History of British Fauna. By B.P. Beirne. New York. 1952. The British Book Centre. 164 pages. \$4.00.

In this book the author discusses the development of British fauna from earliest times to the present day, particularly emphasizing mammals, birds, butterflies and moths. It is a book for ecologists, students and teachers, and its many distribution maps are particularly valuable.

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For Juniors

Four Morrow Junior Books have come to hand together from William Morrow and Company, and will be noted together. *Play with Leaves and Flowers* by Millicent E. Selsam, with illustrations by Fred F. Scherer, is a 64-page story for youngsters about interesting plant movements and what causes them. Easy-to-perform experiments are suggested and this is an excellent introduction to plants for the younger folks. (\$2.00) *Birds and Their Nests* by Olive L. Earle, with illustrations by the author, discusses forty-two species of birds and the architecture that goes into their homes. The young naturalist will find it fascinating. (\$2.00) *What's Inside of Plants?* by Herbert S. Zim, with illustrations by Herschel Wartik, is largely a picture book in color that is an introduction for youngsters, and for no few parents, to some of the basic facts of botany. (\$1.75). *Henry and Beezus* by Beverly Cleary, with illustrations by Louis Darling, is a fiction story for young people and centered around Henry Huggins, hero of the same author's earlier story entitled *Henry Huggins*. The many friends Henry made through the pages of that first book will welcome more about him.

Yosemite Mammals

"Mammals of Yosemite National Park" by Harry C. Parker is the title of a special number of Yosemite Nature Notes published as the June, 1952, issue of the Notes. This 105-page, illustrated booklet is a popular introduction to the mammals, large and small, that the visitor to the park may hope to see. Copies are available at fifty cents each from Yosemite Natural History Association, Box 545 Yosemite National Park, California. An annual subscription at \$1.50 will bring the Notes regularly and such special bulletins as this one.

Jungle Exploration

The Immaculate Forest. By W.R. Philipson. New York. 1952. Philosophical Library. 223 pages. Illustrated. \$4.50.

This is an account of an expedition that penetrated unexplored territories between the Andes and the Amazon. It is the adventure of a team of scientists in the remote jungles of central Colombia under the leadership of the author, who was associated with the British Museum of Natural History.

Antarctica

Stepping Stones to the South Pole. By J. R. Nichol. New York. 1952. Library Publishers. 199 pages. Illustrated. \$3.75.

Antarctica and the South Pole have lured many explorers, and inspired deeds of courage and shown examples of tremendous human endurance. In this book the author brings together the stories of the various quests for the South Pole and the men who sought it.

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UNDER THE MICROSCOPE

By JULIAN D. CORRINGTON

PHOTOMICROGRAPHS FROM SLIDES COURTESY WARD'S NATURAL SCIENCE ESTABLISHMENT, INC.

THE SPLEEN

WHILE an entire language may endure for a long stretch of time, individual words come into and go out of fashion, like clothing styles or auto designs. An old name for any of the organs encased within the body wall is *viscus*; a lung, the heart, a kidney — each is a *viscus* (Latin, an organ within the body cavity). For some obscure reason, the singular of this word went out of vogue many years ago, while the plural, *viscera*, remained in common usage, as also the adjective, *visceral*, or the verb *eviscerate*. We are glad to see, via recent texts and papers in anatomy and histology, a marked tendency to restore this useful noun singular to favor.

All of the major viscera of man have been known from ancient times, anatomy being the oldest of the biological sciences. Gradually, through the ages, physiologists have unraveled the principal functions of one after another of these organs, discarding outworn metaphysical interpretations as soon as the accumulation of exact scientific findings permitted a more objective view. Thus, although anyone knows we take air into the lungs; it was not possible to understand what this air does for the body until after the discovery of oxygen (Priestley, 1774) and its role in that form of combustion called respiration (Lavoisier, 1777). In the absence of factual knowledge, earlier scientists, like others of their day, fell back upon the mystic, and so we read, in ancient and medieval discussions, that the air of respiration mixed, in the heart, with the "natural spirit," described as a "vapor arising from the blood," and thus became "vital spirit," which conveyed heat and life throughout the body by way of the arteries, thought to contain air. This is, of course, professional double-talk, and one of the measures of the progress of civilization is the continuous decrease in the amount of this sort of thing in the scientific literature.

One of the last of the viscera to yield to physiological research has been the spleen, exceeded as a holdout only by the thymus, the function of which is still unknown. The spleen has been described under several names in anatomical history. The Latin term was *lien* (*leé-en*), now obsolete as an English noun, but remaining as an adjective in such uses as the *lienal* or *lienic* artery, words now rapidly disappearing in favor of *splenic*. The Anglo-Saxon designation was *mill*, still seen occasionally,



Section of cat spleen.

but used also to designate the spermaries of fishes through confusion of the two organs, and now largely confined to this second application. An old dialectic English variant was *melt*. In the former humoral pathology (this Department, May, 1952) the spleen was supposed to produce "black bile," — actually dark blood, — and an oversupply of this *melancholia* made a person moody, spiteful, quick to anger. Literary survivals of this outmoded physiology include such terms as *melancholy*, *splenic*, and to "vent one's spleen."

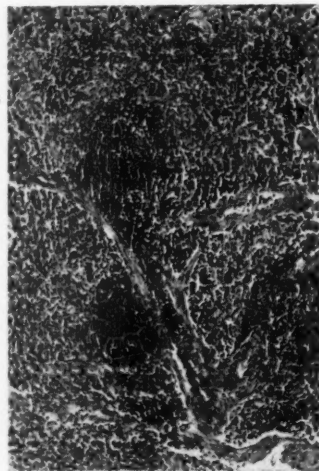
With the passing of such fanciful views, the spleen was left without a function. Given a separate internal organ, how is one to tell what its work may be? With the exception of Galen and very few others, earlier scientists relied on position and connections and, in the absence of clues from sources of this sort, on imagination. Today's approach is experimental — remove the organ and see what happens or what does not happen in its absence; tie off its duct, if it has one, so as to prevent exit of its supposed secretion, and await results; isolate its several elements and test them separately; break down its chemical constituents and inject these into controls. There are many approaches to each such problem, and all possible avenues of attack are tried.

The spleen lies on the greater curvature of the stomach, to which it is attached by a mesentery (gastro-splenic omentum), a double sheet of nearly transparent tissue in which run blood vessels and nerves. Our mysterious viscus is full of blood, the quantity of which augments during digestion, causing the spleen to increase in size. These facts would seem to connect the spleen with the digestive system, but this assumption will not stand up. For the

spleen has no duct and there is no physical juncture with any digestive organ, or with any other organ, for that matter. It produces no known secretion. The reason for its swelling during digestion of a meal is unknown.

In the Seventeenth Century a marvelous new approach to such problems was discovered, — the microscopic. The great Italian microscopist, Marcello Malpighi (1628-1694) is commemorated by numerous disclosures in microscopic anatomy, his name cropping up today in many studies, as in the kidney and skin. In the spleen, the *Malpighian corpuscle* is a lymph nodule, seen as the rounded dark bodies in our illustrations, and accordingly it is now recognized that the manufacture of lymphocytes, one of the important kinds of white blood corpuscle, is one function of the spleen, since this is true of all lymph nodules, wherever occurring. Knowing that lymph nodes in the neck make lymphocytes, it is a justifiable assumption, at least tentatively, that lymph nodules in the spleen do the same; but there is objective evidence, too. Breiner and Weatherford state that in the splenic vein, carrying blood out of the spleen, the proportion of lymphocytes to red cells is seventy times as great as in the splenic artery, which brings blood to this viscus.

The endocrinologists have tried to find one or more hormones produced by the spleen, but without success. Formerly it was said that loss of the spleen, through surgery or infection, resulted in death, but this is entirely false under present techniques; after splenectomy, other organs with more or less similar functions, as the liver, lymphoid bodies, and bone marrow take over and substitute for the missing spleen with complete success. Through modern studies in histology, and experiments in physiology and pathology, it is known that the spleen is a member of the *hemopoietic system* of organs, the blood-forming organs, others being the bone



Detail of cat spleen.

marrow, lymph nodes and glands, hernal glands, thymus and, in the embryo, the liver and yolk sac. Other spellings are haemopoietic and hemato - or haematopoietic. Further, the spleen is a "filter of the blood" in that old and infected red cells are engulfed and digested by splenic cells and removed, so that another sobriquet is the "graveyard of red blood corpuscles." But before analyzing function further we should see something of the construction of this organ.

The human spleen is an oblong, flattened, soft, and glandlike body about five inches long, parallel to the stomach on the left side of the abdomen. It is dark purplish-red in color. The structural plan of the spleen is simple, but its execution becomes devious and is not wholly understood even yet. A capsule of dense fibrous connective tissue surrounds and retains the softer parts of this very flexible viscus, and continues into the interior as *trabeculae* or partitions that divide the spleen into vague areas that some observers have designated as lobes, with these in turn divided into lobules; others have denied the presence of either lobes or lobules. Certain subdivisions may occasionally result in detached portions called *accessory spleens*.

Within the capsule and between cut portions of trabeculae, sections of the spleen present two main regions, known as the *red pulp* and *white pulp*. The red pulp has been said to include *splenic cells*, but in fact there are no separate or special cell components here; both pulps are made of blood vascular cells. These lie within the meshes of a complex network of reticular tissue, invisible without special treatment. The histology of this viscus, largest of the hemopoietic organs, is best approached by an analysis of the blood vessels.

The splenic artery enters and the splenic vein leaves the *hilum*, a name borrowed from botany, where it denotes the place of attachment of a seed, as the "eye" of a bean. The *splenic artery* continues within, branching to follow all the trabeculae. When these *trabecular arteries* diminish to a diameter of about 0.2 mm. they leave the trabeculae and course through the pulp, surrounded by lymphatic tissue (white pulp) in the form of a cylindrical sheath, here and there expanded into spherical or spindle-shaped *splenic nodules* (Malpighian corpuscles). These are dense aggregations of lymphocytes in the reticular tissue framework of the arterial wall. Mostly these assemblies form along one side of the vessel, so that when seen in cross sections stained with hematoxylin and eosin the pink-walled artery is eccentric in the blue nodule, in spite of which it was inappropriately named the *central artery*. Small twigs are given off to the nodule and pulp, then the central artery continues on, leaving the white pulp and entering the red pulp when of a caliber of 40 to 50 micra. This means that the sheath of lymphoid tissue terminates. The vessels are then called *penicilli* (like little pencils), forming a brush-like array of straight tubes, each provided with an

ellipsoidal swelling of reticular cells, at which place the vessel is a *sheathed artery*. The ultimate continuation of these fine arterioles, beyond the sheaths, are short arterial capillaries, but their connections are disputed.

The beginning veins of the spleen are known as *terminal veins* or *venous sinuses*. Both names are appropriate; these channels are terminal from the standpoint of the branching venous tree, and they are also wide. A thin-walled vein with a wide lumen or cavity is a sinus or sinusoid, distinctions between these two words being nebulous. Blood from the venous sinuses flows into *pulp veins*, and these in turn into *trabecular veins*, all of which unite to make up the main *splenic vein*.

The two most important of the unsolved problems in splenic structure concern the walls of the sinuses and the connections, if any, of sinuses with terminal arteries.

The typical blood vessel, be it artery, vein, or capillary, is lined internally with an extremely thin epithelial sheet signalized by the special name *endothelium*. Generalized statements may lead one to believe that this layer of cells is everywhere continuous, the blood always retained within endothelial tubes. But there are exceptions. In place of the simple, unmodified endothelial cells in many situations are reticular tissue cells (reticulocytes) or *fixed macrophages*, which possess many unusual powers. Macrophage means "big eater" and alludes to the fact that such cells engulf foreign matter, as bacteria and dead cells, thus freeing the blood of harmful materials. The macrophage is a specialized cell, the endothelial cell is its unspecialized brother, both derived from mesenchyme or embryonic connective tissue. The fixed macrophage may become a *free macrophage*, breaking loose and wandering through the connective tissues of the body, in which they are very numerous.

Observations of the walls of the venous sinuses show that they are composed of fixed macrophages, with no endothelium, the reticular cells supported by a circular mesh of reticular fibers. Some authorities consider that the walls of adjacent macrophages are united by a common membrane; others hold that such a membrane has only been postulated rather than seen, and that the sinus walls are everywhere perforated by many slits. If this is so, then blood cells may migrate freely in or out of the sinuses, and the blood system in such a place is "open," rather than "closed." Fixed macrophages are found comprising parts of the walls of venous sinuses in other organs besides the spleen, as in the liver, adrenal, and pituitary, as well as making up part of the mass of cells outside the blood vessels in the general tissue or stroma of the spleen, lymph glands and bone marrow. Free macrophages are found, in addition to the connective tissues generally, in the stroma of all these blood-forming organs and even in the far cavities of the lungs, where they engulf atmospheric debris and are known



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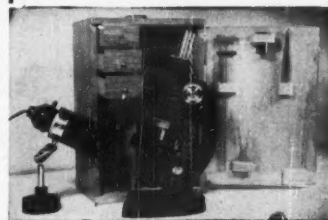
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as dust cells.

Between adjacent venous sinuses in the spleen are strands of the red pulp called *splenic cords* or the *cords of Billroth*. There are no new or different cells here, as some histologists have designated under the term "splenic cells," but rather a general network of reticular tissue, filled with both fixed and free macrophages, and with all of the cells of the circulating blood, in great profusion and mixed without evidence of any assorted or genetic order. Here old red blood corpuscles are digested and removed from circulation by the macrophages, and here also the production of lymphocytes, from the white pulp, continues by additional mitoses.

Most interesting of the questions concerning the spleen is that of the arterial connections with the veins. The final brush-like endings of the penicilli, according to the closed circulation school, join directly with the cells of the venous sinuses; the open circulation school believes that the arteries open among the reticular cells of the red pulp, spilling the blood out into this pulp, from whence it makes its way into the venous sinuses through the slits between the macrophages. Still others visualize both constructions as present. MacKenzie, Whipple and Wintersteiner propose that the splenic circulation is closed when the spleen is contracted, open when it is distended. The trabeculae are provided with smooth muscle fibers and the spleen has been seen in a slow, rhythmical pulsation.

Aside from its duties in producing new lymphocytes and removing old red cells and otherwise filtering the blood, a number of other functions have been ascribed to the spleen. Some investigators believe that monocytes, another form of white corpuscle, develop from lymphocytes in this viscus. The embryonic spleen manufactures red cells, but the normal adult human spleen does not, relegating this task to the bone marrow. Certain other mammals are said to produce red corpuscles in the spleen as adults, the skunk being cited as an example. In some infections the spleen reverts to its embryonic duties, undergoing *myeloid metaplasia*, meaning conversion to a marrow-like construction, and then makes all the blood cells, the body working frantically, as it were, to repair its losses and increase its defences. Maximow and Bloom say that the spleen also acts as a storehouse for red cells, accumulating large numbers of them which are then paid out to the circulation as needed. Reticular cells of the spleen store iron obtained from the disintegration of dead red cells, so that this hard-to-get element may be used again, and it is established that the first rapid production of antibodies to combat foreign proteins occurs in the spleen. It is also probable that the spleen makes opsonins, chemical substances that render microorganisms more susceptible to phagocytosis (engulfment) by the macrophages, thus increasing the activities of these important police cells.

Accidental Scientific Discoveries

ETHER

(Reprinted from *Lab-Oratory*, June, 1951, by permission of Schaar and Company, Chicago).

AS A somniferous agent, the historical notes on the discovery and development of ether depict considerable activity, certainly in no way sleep-inducing to the reader. As the first practical anesthetic, it must have seemed a God-sent pain killer to those undergoing the surgeon's knife; to the profession, a milestone in medical history. But the sordid circumstances of its first discovery, and the stormy controversy that followed, dim considerably this grand achievement in the relief of pain.

The sleep-inducing application of ether was accidentally discovered in the small town of Jefferson, Georgia, in 1842, by Dr. Crawford Long, a practicing physician. The intoxicating effects of ether had been known for some time in this part of the country; the "ether" jag being a popular social diversion. One evening, a group of the community's younger set was indulging in this peculiar pastime. After exhausting what amusement they could from applying the treatment to each other, the partygoers decided to have some additional entertainment by subjecting a poor household servant to the ether fumes. The unfortunate servant resisted strenuously and the heavy breathing caused by the struggle, along with an accidental over-dose, resulted in a much different reaction than expected. No hilarious antics were forthcoming. The poor servant collapsed completely falling prostrate to the floor, apparently dead. The group was so stunned and frightened that several of the participants fled the town. One, however, had the presence of mind to send for a doctor.

When Long examined the body, to his amazement he found not a corpse, but a relaxed body, living and breathing, with pulse and respiration quite normal, as in a deep sleep. A few hours later, the patient awoke, and was soon on his feet resuming his household duties as though nothing had ever happened. Long grasped at once the implications of the affair. He must have reasoned that a similar state of insensibility, with no apparent harmful effects, could be of help in his practice. In subsequent operations, Long used ether and was thus the first to use it as a practical anesthetic. However, this mild-mannered country doctor made no effort whatsoever to disseminate his information or press even the slightest claim.

At practically the same time that Long was drawing his conclusions, an extremely versatile scientist of Boston stumbled upon a similar discovery. Dr. Charles T. Jackson, physician, geologist and chemist, in the winter of 1841, during the course of a lecture, accidentally overturned a container of chlorine. Endeavoring to save the vessel, Jackson inhaled a large volume of the vapor, filling his lungs with

chlorine gas. Although at the point of suffocation, he had the presence of mind to inhale some ether and ammonia that was conveniently situated. He was considerably relieved and surprisingly pleased with the strange feeling brought about by his quick medication. His interest aroused, he continued experimenting, using himself as the guinea pig and soon became familiar with the anesthetic qualities of the gas. It was at this point that the controversial figure of Dr. W. T. G. Morton came upon the scene.

Morton, a dentist by profession, was both a friend and a pupil of Dr. Jackson. Appreciating the need for, and deliberately seeking a practical pain killer, Morton succeeded in obtaining from his friend an ether solution disguised with an unfamiliar odor. They immediately entered into a contract respecting the use of ether as an anesthetic and applied for a patent under the name of "Iletheon."

In 1849 the infamous ether battle began when Morton petitioned Congress for a reward. Another claimant named Wells presented his case, and Dr. Jackson, of course, protested and was further encouraged to fight for his own rights. There is no material available either proving or disproving the claim of Wells, but the Congressional record does state that Jackson's rights were vindicated, while those of Morton were disproved. (August 28, 1852).

In the light of the bitter arguments surrounding what appears to be extremely selfish aims for recompense, Morton perhaps stands none too high in the esteem of the casual observer. Yet his was the result of a deliberate search, born out of the realization of the pressing need for a practical pain killing agent. Furthermore, Morton's professional position and his utilization of the facilities of a great medical center (such as his etherization of a patient at the Massachusetts General Hospital, October 6, 1846), unquestionably carried great weight with the medical profession.

With regard to the findings of Long and Jackson, it proves once again, that accidents have consistently instigated new and improved benefits to mankind.

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And find out how sturgeons roe.
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And then next term you walk serenely
into lab

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